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A. S. BURLESON,
Postmaster General.

TELEPHONE ENGINEER

Volume XIX *CHICAGO, FEBRUARY, 1918* *Number 2*

When the Emperor of Brazil

stopped to examine a "curious toy" at the Centennial Exposition in 1876, he added nothing to the real merits of the Telephone, but its growth into a great public utility started from that accidental happening.

When the Governments of Great Britain, France, Italy, Australia, the Canadian Provinces, and practically every other great country of the world, investigated,

Endorsed and Adopted the Automatic Telephone System

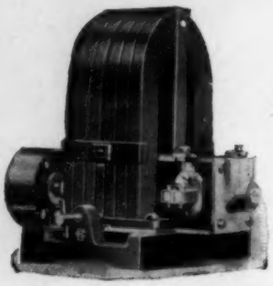
nothing was added to the essential superiority of that equipment.

Their action was not accidental, but was the result of careful study and deliberate choice. The wisdom of their course has been proved by actual operating experience.

The world followed the example of the Emperor of Brazil and adopted the Telephone.

The telephone men of the world today are following the example of the leading governments in the adoption of the Automatic System.

AUTOMATIC ELECTRIC CO.
CHICAGO



Magneto Generators and Motor Generators

For Operating Polarized Bells

The **single machines** are used in small exchanges where there is some form of **mechanical power** from which the magneto may be driven by a belt, and **where there is no electric power available.**

If, however, **electric current may be obtained,** A MOTOR-GENERATOR WILL BE FOUND MORE CONVENIENT.

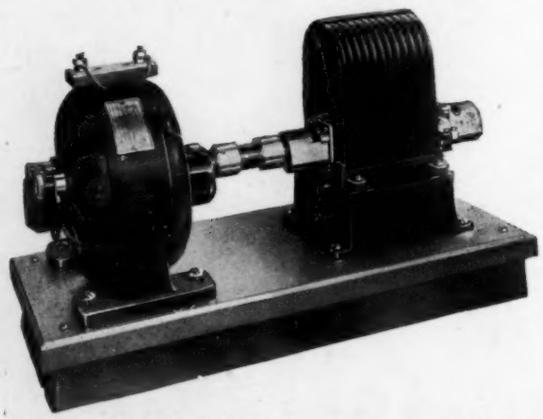
The Magneto Generator is made in 3 sizes:

The MS-1 will ring simultaneously about 50 bells with an average resistance of 1,600 ohms per bell:

The MS-2 will ring simultaneously 75 bells:

The MS-3 will ring 100 bells simultaneously, under same conditions. These figures being based upon an average line resistance of about 200 ohms.

Use the MS-1 for 500 Subscribers.
" " MS-2 " 500 to 1,000 Subscribers.
" " MS-3 " 1,000 to 1,500 Subscribers.



WHERE ELECTRIC POWER IS AVAILABLE THIS MAGNETO MOTOR-GENERATOR IS A MOST CONVENIENT AND ECONOMICAL SOURCE OF RINGING SUPPLY.

It gives constant frequency and constant voltage without any adjustment of any sort.

If you are interested in this Motor-Generator, advise us the kind of day current you have; the number of lines; the number of operators.

The Holtzer-Cabot Electric Company
Chicago, Ill. and Boston, Mass.

OshKosh

"The Service Quality Tools"

Did you read the series of letters from prominent jobbers and electrical supply dealers which we recently published in Electrical Review? Were you not impressed by the high indorsements which these people gave OSHKOSH TOOLS? The judgment of the trade is based on years of experience which gives them a very definite knowledge of the quality of service which OSHKOSH TOOLS have rendered their customers.

Before ordering your tools for 1918 investigate the OSHKOSH line. Write today for our catalog—also the name of your nearest jobber.

Oshkosh Mfg. Co.
OSHKOSH, WIS.

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Entered at Chicago Post Office as Second Class Mail Matter

Telephone Engineer

WITH WHICH IS CONSOLIDATED
The Western Telephone Journal
ESTABLISHED 1902

PUBLISHED MONTHLY BY
ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO, ILL.
Telephone: Harrison 3014—All Departments

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Per Year $2.00

Canada	$2.50
Foreign	3.00
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VOL. XIX CHICAGO, FEBRUARY, 1918 NO. 2

Restricting the Abuse of Telephone Facilities

CONSERVATION of conversation, looked upon as a pleasantry when it was first mentioned in the daily papers, is beginning to assume an importance secondary only to conservation of coal and wheat. The tremendous increase in government traffic, the augmented use chargeable to an unprecedented winter, and the general expansion of talk due to the additional number of things to talk about, all have piled their new burdens upon a telephone system already handicapped by loss of men and shortage of material. It becomes necessary that telephone users restrict themselves to essentialities, and that telephone service companies take steps to assist toward that end.

While a saving in labor would best be accomplished by a reduction in the total number of calls, considerable economy would be effected by reducing the time per call that equipment is tied up. This refers, of course, to local lines; long distance was "efficiencyized" long ago.

On the argument that long distance conversations are more important than local messages, there should be less public resistance to a local time limit than there is to the customary three-minute toll allowance.

It is common knowledge to both telephone men and the public that the unimportant messages are the longest. Comparatively few business calls, or even social messages that really communicate anything, extend over three minutes. "Overtime" on a toll line is proportionally little used, and cheerfully paid for when it is used.

Party line subscriber pay stations commonly have a five minute limit, at the termination of which the user is requested to drop another nickel. Mere enforcement of this existing and known rule would accomplish much; for it is the most abused of all telephone privileges. In residence sections of large cities particularly, little attempt is made by the operators to hold party line subscribers to their five minute allotment. It is our recommendation that for the duration of the war, at least, the five minute pay station rule be as rigidly enforced as the three minute toll rule.

The news dispatches report a Washington, D. C., business house which has "hooverized" its telephone service by prohibiting the use of its telephones for any but business calls. If this were made a national movement, it would doubtless result in as great a saving as our voluntary observation of wheat and meat restrictions. Left entirely to the initiative of telephone users busy with their own problems, however, it is doubtful if enough will adopt the suggestion to make a perceptible depression in the traffic curve.

Methods by which the subscriber could help in the conservation of service will occur more readily to active exchange managers than they do to us. We can see no reason for hesitancy in pointing out these methods to subscribers as a patriotic duty. That will help a little, at least.

Means by which the companies can help themselves are not lacking, either. No company can dictate the nature of the messages it transmits; but it can dictate a reasonable time duration for them. That in itself, as we said before, will eliminate much of the foolish conversation that now makes up a too substantial portion of the total telephone traffic.

While it is probable that a majority of all telephone companies should raise their rates; and while telephone men generally regard their operations as highly efficient, there still

remains opportunity for astonishing improvement in the way of concentration and abbreviation of public use of local lines. Restrictions are not as closely drawn as they should be. The fact that telephone engineers have so perfected their equipment that telephoning is as easy as talking, should not give occasion for the unbridled abuse of what is really a privilege.

A little judicious restraint of telephone use would do much to increase appreciation of science's most wonderful application.

Women Doing Men's Work

WHEN we receive well authenticated reports of the successful accomplishment of "men's work" by women, our masculine ego accepts the news in a spirit indicated, if not vocally expressed, by the exclamation "Well, well! Is it possible!" We are wont to think of femininity as fitting well into the more or less dainty tasks of office routine, but debarred by nature from the sterner occupations of the bench and the road.

The present labor situation is rapidly proving most of this sentiment to lack common sense. It is being pretty well demonstrated that woman easily become competent to handle almost any task of skill not dependent upon muscular exertion or physical endurance—and even those "protected" fields are not wholly invulnerable to feminine attack.

We must confess to a lingering sense that a woman climbing a telephone pole is still rather out of place, though some of them are doing it with fair success. But there are a host of other jobs that can be filled as competently by women as by men.

It would be foolish to make a catalog of occupations and say that this one is suitable for women and this one is not. An application of plain reasoning by the employer to each case as it comes up will settle the question in advance. If no woman has ever done the work, why not? What phase of it is dependent for success upon the sex of the worker?

So persistent and unreasonable is the habit of regarding women as limited capacity employes that some employers would hesitate to put them at sweeping floors, polishing metal work, weighing out parts or testing samples, despite their almost universal experience along similar lines.

It is our opinion that in many of the skilled occupations of the telephone exchange—the connecting and soldering and testing jobs—the women now employed will set a hot pace for the men when they return from the war. But if they do the work better, proving that it can be done better, more power to them.

Don't be afraid that the employment of women in "men's jobs" will upset economic conditions, or start a revolution. When the boys return there will be a sudden increase in the business of the marriage license clerk, and the real occupation of humanity will be resumed. The women don't want the men's jobs permanently—they only want to do their part while masculine America is engaged in its supreme task.

Patriotic Side Lines

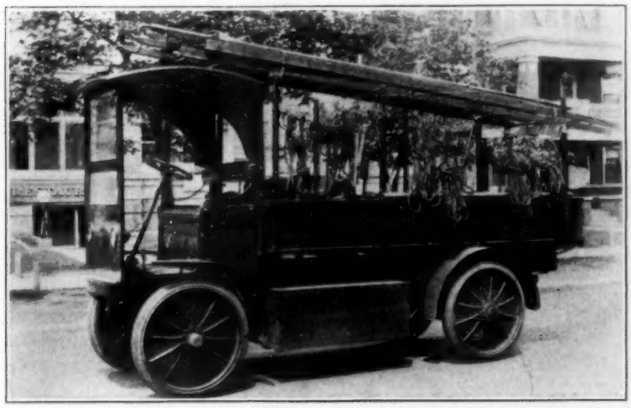
EVERY telephone exchange can become a selling station for thrift and war savings stamps for the asking. Subscribers who call to pay their bills will find it particularly convenient to put their change into stamps, to the benefit of themselves and the nation and the satisfaction of the helpful telephone manager.

There never was a better scheme for helping the people save money than this, in spite of all the vigorous plans worked out by ambitious savings banks. There never was an easier way for public officials like telephone men to help their government. And incidentally they are helping a certain percentage of their irresponsible, shiftless subscribers to become thrifty and responsible—thus building up the morale of the community and starting many a small subscriber on the road to success, and consequently to geater use of telephone service.

Almost every telephone office has in its files some old drawings on tracing cloth—plans of the building, the layout of the operating and terminal rooms, possibly some circuit diagrams. Blue prints have been made from these, and the original tracings will never be used again. These tracing cloths make the best of Red Cross bandage material, and any public spirited laundry will wash them out free of charge. That is just another way of helping your country with waste material.

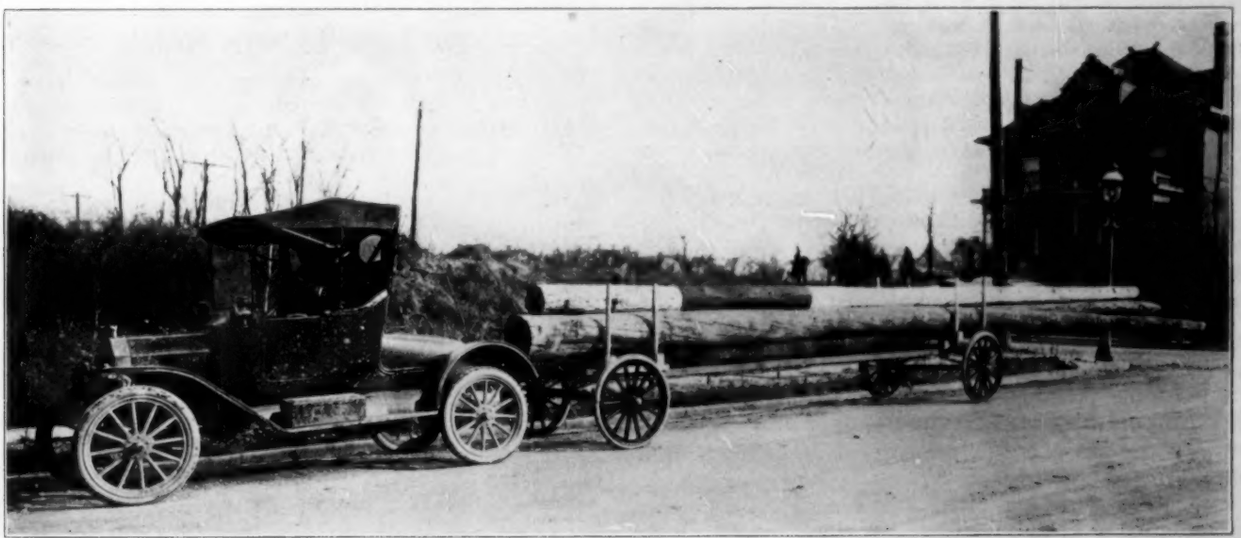
This Is One of the Denby Telephone Trucks Used by the Fort Dodge Telephone Company's Plant Department, Fort Dodge, Iowa, with Very Satisfactory Results.

The Familiar Old Central Union Trouble Wagon, Developed by the McIntyre Company at Auburn, Indiana, and Used in Several Districts of the Central Union System.



Two-Ton Electric Truck Made by the Walker Vehicle Company, Chicago, and Used with Great Success by the City of Chicago's Department of Gas and Electricity. This Truck Uses Either Edison or Lead Storage Batteries.

An Old But Very Serviceable Reo Truck Carrying a Fair Load of Telephone Poles, Besides Its Driver and Lineman Passenger. This Is Used by the Caldwell (Kas.) Telephone Company, and Has Seen Eight Years Service.



This Trailmobile Was Developed at Cleveland, Ohio, to Help the Ubiquitous Ford Carry Long Poles. One of the Poles Shown Is Forty-Five Feet Long. The Chassis Capacity Is Two Thousand Pounds. The Weight Is Eight Hundred Pounds, and the Wheel Base 17 Feet 5 Inches. Solid Tires.

Buffalo Merger Gets O. K.

Announcement that the proposed merger of the Federal Telephone Company with the New York Telephone Company which was approved by the people of Buffalo in a referendum more than a year ago, received the official endorsement of the Department of Justice at Washington January 16, was made by N. C. Kingsbury, vice president of the American Telephone & Telegraph Company, at the weekly luncheon of the Rotary Club at the Hotel Statler January 17.

This removes the last obstacle to the unification of the two systems, which will be begun at once, although it will not be completed for about two years, according to Mr. Kingsbury. Mr. Kingsbury made this announcement following an address to the Rotarians on the immense amount of work which the telephone interests have performed for the government and the various industries engaged in work incident to the war.

Although the merger had received the approval of the people of Buffalo, the opinion of the Department of Justice that the merger was not in violation of the law was necessary to the fulfillment of the plan. The approval of the government covers not only Buffalo but the western end of New York State, where other mergers have been projected. The consolidations, however, said Mr. Kingsbury, should not in any way be considered as establishing a monopoly of telephone service in Western New York for the New York Telephone Company, as in fact, the company is giving up more stations than it is acquiring. In Rochester and Jamestown, the Bell system is retiring in favor of the Independent companies, which will merge the two services.

"Some people have been advocating the amalgamation of all telephone companies throughout the country as a war measure, and have claimed that this would release 10,000 men for military service," said Mr. Kingsbury, incidental to his announcement of the local merger. "This statement is erroneous. Such a merger would require for the physical unification of the lines a much longer period than the war probably will last and would require the expenditure of millions of dollars in materials. Rather than releasing men for military service, thousands more would be required."

Mr. Kingsbury made it very clear that the actual physical merger of the Federal plants with the Bell would have to proceed very deliberately. Two telephone systems, he said, cannot be thrown together without the expenditure of a great deal of money, labor and material, as otherwise a great waste would occur, with resulting impairment of service. It will be done, however, he stated, with as little interruption of regular service as possible.

In Rochester a new corporation is to be formed to take charge of the Bell and Independent properties.

Not only Rochester, but Monroe County and the whole Western New York section will have a single telephone system. The plan has been worked out by George R. Fuller, president and general manager of the Rochester Telephone Company, and Frederick C. Goodwin, attorney and director of the company. Announcement of the proposed consolidation was made by Mr. Goodwin in his office in the Insurance building.

Mr. Goodwin, in the presence of Mr. Fuller, made the following statement:

"For some months Mr. Fuller and myself have been working upon a plan looking to the elimination of duplicate telephone service in the city of Rochester and the consolidation of the Bell and Independent companies. After an extended study of the matter and numerous conferences with the officers of the New York Telephone Company, a plan has been formulated to which we have finally secured their consent.

"That plan provides, in general, for the consolidation of Bell and Independent properties throughout Western New York. So far as Rochester is concerned the plan involves the organization of a new telephone corporation which will be controlled and operated by Mr. Fuller and his associates, all of whom are local men in no way connected or affiliated with the Bell company, which will acquire all the properties of both the Rochester and New York companies in the city and operate them as a single system. This corporation will also acquire and operate all the telephone properties, whether now Bell or independent, in the territory naturally tributary to the city of Rochester, including all of Monroe County and the villages of Candaigua, Mt. Morris, Dansville and all the intervening territory.

"The entire plan is conditioned upon and will not become effective except with the approval of the telephone-using public in the territory affected, nor can it become effective except with the approval of the Public Service Commission of the state of New York, to whom must be submitted, and who must approve, all the details of the consolidation, capitalization, etc.

"Among other conditions in the plan is one requiring the consent of the Federal Department of Justice at Washington. The matter has been submitted to that department and, so I am informed, has recently received the approval of that department.

"The advantages and benefits to occur to the people of the city of Rochester through the consolidation of the two telephone systems are so many and so obvious that enumeration or discussion of them would seem to be unnecessary. Instead of the burden of the expense of two telephones and the consequent disadvantages we shall have, if the plan becomes effective, a single system controlled and operated by local men, every subscriber of which will be able to reach every other telephone subscriber in the district, and, in addition, through the long distance lines of the Bell system, with which the new corporation will connect, every subscriber will be able to connect and talk with practically every telephone in the United States."

A. T. & T. Sells Notes

American Telephone & Telegraph Company has sold to a banking syndicate headed by J. P. Morgan an issue of $40,000,000 one-year 6 per cent notes.

These notes are publicly offered at a price to show a return of 7 per cent.

This financing is designed to provide funds to meet the maturity on February 1 to 18 of $18,500,000 notes of subsidiary companies and will furnish a balance of about $21,000,000 of cash to reimburse the company for extraordinary outlays incident to meeting the war requirements of the government.

The new notes are not obligations direct of American Telephone, but are issued by five subsidiaries and are indorsed by the parent company.

The notes are divided as follows:

Cumberland Telephone	$ 6,000,000
Iowa Telephone	4,000,000
Nebraska Telephone	5,000,000
Northwestern Telephone Exchange	10,000,000
Southwestern Telephone	15,000,000
Total	$40,000,000

Trucks, Trailers and Special Bodies

Miscellaneous Motor Cars and Attachments Found Useful to Telephone Men

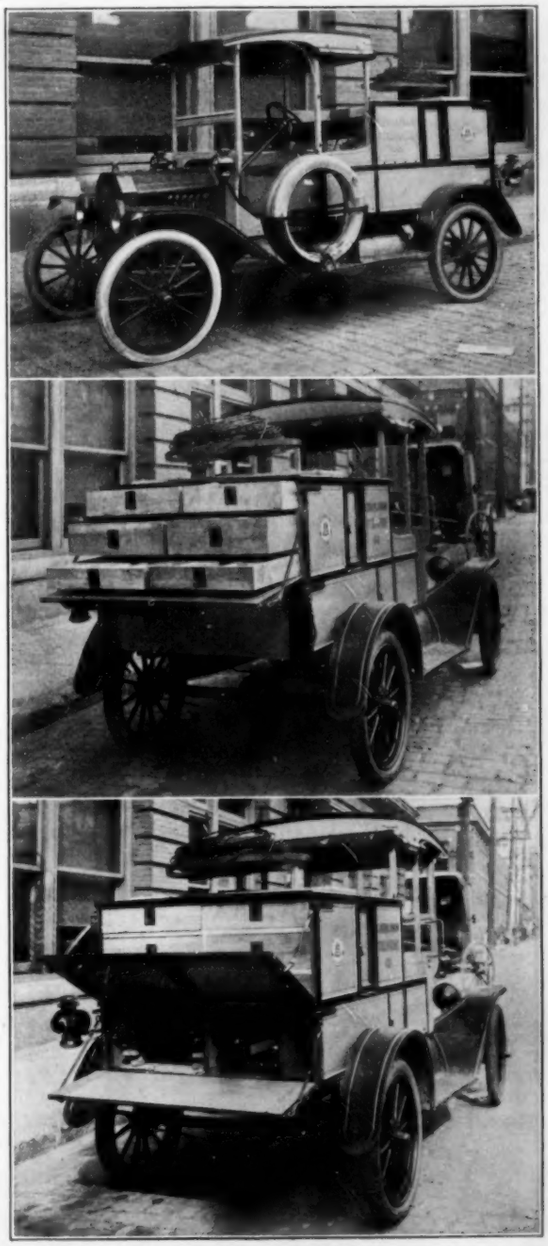
IN the center of this page is a vertical group of views showing quite clearly the construction of a special loop body, for use on a Ford chassis, designed by Ohio Plant Superintendent J. W. Cherry of the Central Union Telephone Company at Columbus. Throughout Ohio, where the situation permits the use of but two men for loop work, this type of body is being used very largely. Mr. Cherry, the designer, reports about twenty-five in service in his division. The special conveniences of this truck are so apparent in the photographs that extended description is unnecessary.

The use in the aggregate of special automobile trucks, cars and trailers by the telephone company is enormous — not mentioning the motorcycles and three-wheelers perform so well for quick repair work. A thorough treatise on the subject would approach the dimensions of a book—one that some technical writer may be inspired to compile some day. This article, therefore, has no pretentions beyond serving as a small collection of more or less related matter pertaining to the telephone vehicle, with at least, we hope, a slight interest for the users of such vehicles.

Telephone company officials sometimes display a national hesitancy to name specifically the makes of cars used by them, especially in a comparative way. Their reports on the general topic of car usefulness, however, are valuable. For example, Superintendent A. R. Clark of the United Home Telephone Company at Muskegon, Mich., wrote some time ago:

"We have used motorcycles for the past four or five years and our records show that they have lived up to our expectations in hurry-up requirements in all cases of trouble where there is not much material to be carried and have proven a time and labor saver in many instances.

"In regard to automobiles and trucks, we have been using them for only the last year and for this reason our records are not complete as to their cost. But there is one thing about them, they certainly get the men on the job with very little lost time. The main trouble we have found is to get the right kind of a chauffeur, for our experience has shown that a driver may seem competent and is doing everything that is necessary and keeping the car running, and all at once something goes to pieces and it is caused by carelessness and neglect upon the driver's part. This is one of the disadvantages of running a truck as against that of using teams.



Here Are Three Views of a Special Ford Loop Body Designed by Plant Superintendent J. W. Cherry of the Ohio Central Union Telephone Company. Twenty-five or More Are in Service. The Views Show the Convenient Arrangement of the Body for Carrying All Necessary Equipment.

"We have started a record for the coming year which will show what it costs to operate our trucks, motorcycles and any of the other vehicles which we have and probably the next time you are ready to compile information on this subject we will be able to furnish you with complete data that will not only be interesting, but of value to you and others."

We hope to present the information mentioned in that last paragraph at an early date.

General Superintendent Minor Corman of the Central Home Telephone and Telegraph Company, Louisville, Ky., says:

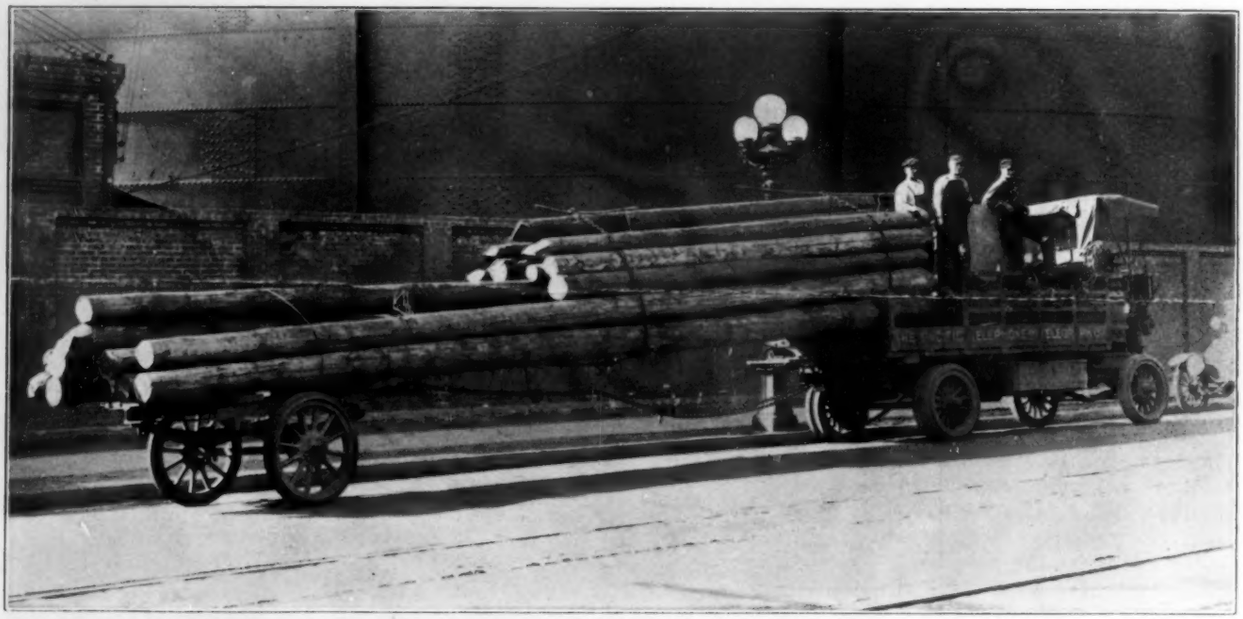
"We are replacing all livery equipment with automobiles and trucks.

"We have found the Ford runabout to be comparatively inexpensive for trouble and maintenance work, soliciting, etc. We are operating a number of trucks which have been built up with the truck units in connection with the Ford engine and chassis. We find such trucks to give extraordinarily good service for light work; however, they will not answer the purpose for heavy work, as their capacity is limited.

"The motorcycles have proven an absolute failure so far as our experience is concerned."

Manager E. G. Miller of the Warren and Niles Telephone Company, Warren, Ohio, reports:

"We have three automobiles in use: One Standard 1½-ton truck, covered top, for heavy line, cable and general construction work with attachments to use a 2-wheel pole truck or a 4-wheel pole wagon as a trailer.



This Is a Two-Ton Dolly Belonging to the Pacific Telephone and Telegraph Company, and Made by the Los Angeles Trailer Company, Los Angeles, Cal.

"One Overland delivery wagon, covered top, arranged for installers on light construction and repair work.

"One Ford runabout with open wagon body for rural trouble or installing."

Vice-President and General Manager W. H. Bryant of the Home Telephone Company, Mobile, Ala., says:

"We have two automobiles and two motorcycles in use for our company, but have no motor trucks. We believe that the automobiles and motorcycles are great money savers."

Both gasoline and electric motor trucks are utilized to advantage in this country, as well as in Europe, in pole line construction for telephone, fire alarm, police, telegraph and electric light and power service. One of accompanying illustrations shows a gasoline motor driven truck developed by the Republic Motor Truck Company at Alma, Mich., for pole erection with hoisting and equipment and auxiliary apparatus, which is typical of this form of motor truck service. Another photograph (on page 55) shows a two-ton electric storage battery truck of the Walker type utilized by the Department of Gas and Electricity of the City of Chicago, as developed in that municipality, and indicates the usual equipment of ladders, ropes and other tackle employed in construction and repairing modern pole lines.

The designers and constructors of this electric truck claim that more than three-quarters of all city and suburban haulage is electric service and not gasoline or horse service. In other words, modern electrics do this work more economically and satisfactorily than gasoline or horse-drawn vehicles.

They hold that the preponderance of the gasoline pleasure car has caused many gasoline truck users to believe that gasoline trucks should be used for all commercial haulage, and has resulted in widespread misapplication and consequent unnecessary expense. They point out that excessive mileage or speeds require the use of gasoline trucks, even at a much greater cost of operation, but it is not good business policy to use gasoline trucks where electrics will do the work cheaper and better. The ever-increasing cost of gasoline and the decreasing cost of electricity have forced thousands of motor truck users to investigate their service requirements and haulage costs. The result is the use of electric trucks wherever they can be used and gasoline trucks only are used where the service conditions demand the use of the more expensive power, and more complicated and shorter lived mechanism.

The electric balance drive is simplicity itself, as it consists of only ten parts, all rotating and balanced, and all enclosed in the hollow rear axle and rear wheels in electric truck illustrated.

Extremes of weather prove the real worth of these electric vehicles. During the extreme heat of summer, and also in mid-winter, rain or snow, sleet or hail, regardless of the temperature, these electric vehicles are always reliable and efficient.

The high and permanent efficiency of the balance drive under all load and road conditions is due to the balance of its working parts, all housed in the hollow rear axle and hollow rear wheels, comprising only these ten simple parts, all rotating. The one electric motor is located in the hollow torpedo-shaped rear axle and the one differential is direct connected to one end of the hollow armature shaft.

There are two draft shafts extending from the differential sockets into the center of each hollow rear wheel —with a pinion on the wheel end of each shaft. The four idler gears are located two in each rear wheel, mounted on the stub-axle yoke arms and the two rim gears are fastened to the inside of the tire rims.

With the balance drive, the power is transmitted in a steady, balanced, efficient manner from a single motor to the very rims of the rear wheels. The motor and direct-connected differential drive the shafts, the pinions of which drive the wheels by means of the idler and rim gears. The wheels are dirt and water-tight—being of specially designed steel disc type, the sides of which are formed by two pressed steel discs with radial corrugations in the form of spokes. They give greater strength than wooden wheels and their outside surfaces are much easier to keep clean.

A single electric motor of the series type is used, fully enclosed in the hollow rear axle with a large diameter, hollow armature shaft mounted on extra large ball-bearings. The motor is designed for maximum efficiency under variable load conditions and 60-volt motors are used with Edison batteries and 80-volt motors for lead batteries. The self-contained direct-connected bevel gear type differential with case is bolted to the flange integral with hollow armature shaft and drives the shaft sockets on the center line of axle.

The maximum speed is from 15 to 10 miles per hour, depending upon the load capacity of the vehicle, and service conditions. The brakes include two sets of the large contracting also expanding type, both on rear wheels and operated by right and left pedals. The steering is accomplished by means of a wheel mechanism, located on the left hand side, while the speed control is by means of a continuous torque drum type controller, giving five speeds ahead and five reverse, located under the seat.

Even a light motor car can be used to advantage in telephone line construction work as indicated in the photograph of a two-cylinder auto used by the Caldwell Telephone Company. Caldwell is a busy little city of 3,000 inhabitants situated in southern Kansas and was quite prominent at one time as a frontier town. It is surrounded by vast wheat fields.

This car has been in constant service since 1909 and G. W. Shiflett, with the help of hustling linemen, has brought from a tangled mass of wire and decayed poles, an exchange and equipment thoroughly up-to-date.

Another photograph on page 55 shows a motor truck utilized by the Fort Dodge Telephone Company, of Fort Dodge, Iowa. It is a one-ton truck and has one feature which is somewhat different from other special telephone bodies in use. Immediately behind the driver are mounted the two reels used in stringing wire in a vertical fashion instead of the customary horizontal manner. The telephone company found that the old-fashioned horizontal mounting required a very wide board and made necessary an entrance door to the garage a great deal larger than is necessary with the present arrangement. The wire reels being mounted close to the driver enables him to attend to them without any trouble while the linemen are stringing the wire. Another feature of the arrangement which is especially valuable and which is shown in the photograph is that the compartments for carrying miscellaneous equipment and supplies are all arranged on the outside of the truck, thus making it entirely unnecessary for the workmen to climb back and forth, into and out of the truck, to secure whatever supplies are needed.

The doors to these special compartments being hinged at the bottom, fall down to a horizontal position, which furnishes the equivalent of a work bench. These features greatly increase the speed of the workman in securing the piece of material which he needs.

This telephone truck has a motor which is run at a speed that is somewhat faster than customary, but by doing this the economy of the motor increased. Thermosyphon cooling with unusually large piping and radiator capacity is used so as to obtain a uniform temperature in all parts of the motor and under all conditions of load and speed. The The clutch and transmission are mounted on annual ball-bearing so as to reduce friction to a minimum and eliminating the possibility of power loss and wear from misadjustment.

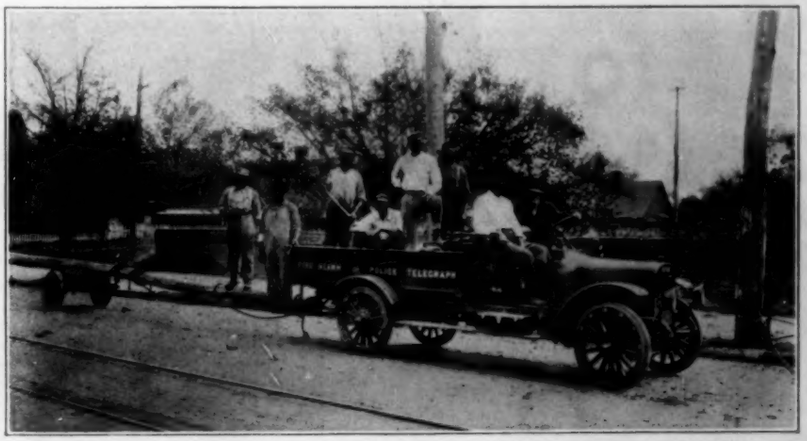
One of our illustrations shows a telephone and telegraph service motor car of English design developed by the Lacre Motor Car Company, Ltd., of London, England, and utilized by the British Postoffice Department. Other photographs show the International trucks of the Cleveland Telephone Company in service, and a McIntyre telephone wagon developed at Auburn, Indiana. There are a number of these trouble wagons in service with two-cylinder air cooled motors of 14 h. p. and 20 h. p. capacity and others provided with water cooled motors developing 20 h. p. and 30 h. p., where heavy service is required.

The telephone and telegraph trouble work of many companies in the United States and Canada is now done with up-to-date motor trucks of varoius types.

Discussing some time ago the question of quick installations—now temporarily of reduced importance—H. L. Johnson, supervising foreman for the Bell Company at Kansas City, Mo., said:

"We are agreed that motor trucks are the saving factors in present day transportation methods, and yet, owing to the vast difference in cost, size and number of makes, it is a matter of the greatest importance therefore, that we select the proper equipment for our particular needs. Body design and equipment for carrying material and apparatus should come in for very careful consideration. Many dollars may be wasted in the careless handling of supplies and particularly in transportation on installation trucks. The labor value of lost time in hunting material in a jumbled up truck is no small one. Too often the material is not there when needed, assuming there should be a little of everything in the pile. Inventories are often incompleted on account of the labor involved in separating the material. An indefinite and very often an excessive stock is carried for the reason that no definite quantity or place is provided. In substance, there is always the tendency to overload on account of the apparent inconvenience in reloading oftener.

"With the above views in mind, it was the intention to have a truck as light as possible and with a body designed along these lines as follows: First, cutting down the space so as to prevent overloading. Second, a place for everything, screws, shields, sleeves, and all material and apparatus each of its kind and size, to its own compartment. Third, all compartments, tills, etc., visible easily accessible, and within easy reach.



A Republic Gasoline Motor Truck, with Pole Trailer, Used in Pole Line Construction Work.

"We reasoned that a Ford car should prove heavy enough for a large percentage of our installation work and particularly in the method of its use. Low first cost and maintenance are the recommending features for this particular make.

"A detachable body was built and slipped on the back of the regular Ford roadster. By removing the turtle back only, including all its equipment features, the cost was less than half the standard plain delivery body without any equipment features whatsoever.

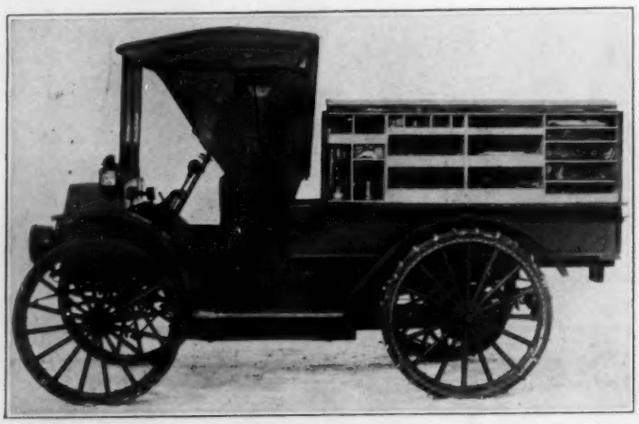
"Eliminating cost, the worst objection to the delivery body and some other bodies is their too great length, generally five feet or more. This is certain to put an overhanging overload almost entirely on the rear axle and its spring. Shortening the body length to four feet or less will, of course, distribute the load more evenly between the front and rear axles and for which place the weight was intended. The car also when depreciated could be more easily disposed of with the regular roadster body intact.

"The ladders and workman's tool box are hung on the left-hand side. Compartments for directories, protectors, mats, fuses and small miscellaneous parts are built near the top of the bows. Interior, ground and cross connect wire are suspended on straps. The instruments are carried in a partitioned box in front of the interior wire. An additional metal material box is attached to the right side of the body.

"A brief explanation of our method of installation will explain the particular purpose for which this car is used. It is economy, of course, to keep all motor vehicles moving, which cuts down the number needed. To do this a truck cannot remain long at one job, by serving therefore three one-man gangs or jobs, a combination installer in charge of the truck will visit three men or jobs each in their turn, helping, leaving the necessary material and directing the work.

"An installation is started always by one man, it will be finished by the same man either alone or with the assistance of the pilot truck and its combination installers and if need be the help of the other two installers associated with the truck which sometimes becomes necessary on account of unforeseen obstacles encountered in the work, miscellaneous material not usually carried by the installer in his grip, different type of apparatus from that which was ordered, special orders requiring immediate attention."

The car Mr. Johnson describes was illustrated on page 153 of our October, 1917, number.



One of the International Motor Trucks Used by tthe Cleveland Telephone Company's Plant Department.

The Central Union's McIntyre Trouble Wagon in the Field.

A great deal of interest has been aroused by the several devices now on the market for lengthening the wheel-base and reducing the gear ratio of a Ford chassis, thus fitting it for surprisingly heavy work.

A solid twelve-month of satisfactory service at a daily upkeep cost of $1.33 is a record of a Smith Form-a-Truck operated by the Glen Telephone Company of Johnstown, N. Y. Or, if interest on the investment at six per cent and a depreciation charge of twenty per cent be included, the total will not exceed $2.00 a day.

A second Smith Form-a-Truck, which, as a converted unit, has been in service but five months, following a nine months' service of the Ford car as a light truck before the Form-a-Truck attachment was put on, and which thus brings all of the repair charges for the entire year into the five months, cost less than $1.60 a day for maintenance charges.

It will be noticed by reference to Table I that practically all the expense for a year's repairs was concentrated in the months of March and April, during which period the truck was in the shop and idle thirty-three days. This probably included the last three weeks in March and the first week in April and accounts for the low mileage during that period and the excessively high mileage rate charged against it. The same explanation is due regarding the July record of Truck No. 5, as indicated in Table 2.

It is, however, the average which counts. Truck No. 4, during a year's service and with but eighty-three idle days, accomplished a mileage of 5,276 miles at a cost per mile of 9.2 cents. Truck No. 5, during five months, and under the handicap of heavy repair expense to restore the wear and tear of nine months' previous service, and with thirty-seven idle days, accomplished 2,291 miles at a cost of 10.3 cents per mile. It is not unlikely that during an equal period, based upon this showing Truck No. 5 would beat the record of Truck No. 4.

This record challenges comparison for similar service, mileage and satisfaction with any horse equipment whatsoever. For the number of days actually worked, Truck No. 4 covered a daily mileage of about twenty-three miles. A team of horses and a wagon doing similar work is limited to about fifteen miles a day at the best. According to figures compiled recently by a traction expert, and taking into consideration just those items of horse and wagon maintenance which correspond to those items of truck maintenance given in the record of the Glen Telephone Company, the cost of a team and wagon is $3.53 per day as compared with $1.33 for the truck. This comparison would be still more emphatically in favor

FORD AUTOMOBILE No. 4 EQUIPPED WITH SMITH FORM-A-TRUCK

Placed in Service May 25th, 1916.

Operating Record from May, 1916, to April, 1917.

Month.	Mileage.	Gal. Gas.	Aver. Mile per Gal.	Storage.	Repairs.	Tires.	Gas and Oil Misc.	Total Monthly Cost.	Aver. Cost per Mile.	Days Idle.	Reg. and License N. Y. State.
1916—											
May	140	18	7.8	.....	.....	.....	$ 10.30	$ 10.30	.074	..	.....
June	530	70	7.6	$ 3.50	$ 10.50	.....	33.04	47.04	.089	7	.....
July	563	55	10.2	3.50	1.13	.....	14.20	18.83	.033	6	.....
August	513	72	7.1	3.50	1.25	.....	22.03	26.78	.052	5	.....
September	496	64	7.7	3.50	.85	.....	18.80	23.15	.047	4	.....
October	868	120	7.2	3.50	1.65	$ 3.21	36.19	44.55	.064	5	.....
November	635	87.5	7.2	3.50	6.16	15.66	24.83	50.15	.079	5	.....
December	557	119.5	4.7	5.00	14.32	8.41	33.71	61.44	.1103	6	.....
1917—											
January	216	74	2.9	5.00	5.35	.....	21.38	36.73	.17	7	$ 5.00
February	302	55	5.5	5.00	4.15	.....	19.03	38.18	.1206	5	10.00
*March	78	38.5	2.03	5.00	60.05	.....	7.98	73.03	.9367	24	.....
April	378	38	9.9	5.00	26.65	10.11	14.44	56.20	.1492	9	.....
12 months, May 16 to April 17	5276	811.5	6.5	$46.00	$132.06	$37.39	$255.93	$486.38	.092	83	$15.00

*The averages for the month of March and April, 1917, are due to the fact that the truck was undergoing a general overhauling in repair shop.
The figures above do not include any depreciation on car or interest on money invested.
Figures arranged and compiled by the Engineering Department.

of the truck were the relative efficiency of team and truck taken into consideration.

The "dolly" to the construction man has always been as necessary as the "jenny" or derrick; neither one can be placed in the discard when it comes to pole line construction. Where there is a pole to be set, both are found on the job. Previous to this horseless age the company blacksmith constructed the dolly from the rear half of an old lumber wagon with bolster, a useful and standard tool, until the introduction of the motor car and truck. The blacksmith construction applied to the horse-drawn vehicles was as good and as true as the old one-horse chaise which stood, as you all know, 100 years to a day. That eventful day in its history was when it was applied to the "speed 'em up" motor at 25 per hour. First it was a hot journal with a locked wheel, then it was crystallization of axle through vibration and successive replacements. Today the old blacksmith construction is seldom seen on the highways, but in its stead we find the up-to-date, high speed motor type constructed dollies.

Engineers now realize that it is as necessary to have roller bearing axles, rubber tired wheels, resilient springs and steel frame constructed dollies as it is to have these same specifications in the motor truck itself. The dolly is required to travel at the same rate of speed and often carries from three to five times the load the truck carries. To meet these requirements the Los Angeles Trailer Company has for the last three years supplied all Pacific Coast public utility companies with their up-to-date motor type construction high speed dollies. One of the accompanying photographs shows a two-ton dolly in service at Los Angeles, California, by the Pacific Telephone & Telegraph Company.

The illustration at the bottom of page 55 shows a novel trailmobile for telephone and telegraph poles developed at Cincinnati, Ohio, to meet the demand from different telephone and telegraph companies throughout the country for a quick method of delivering the long poles. This trailmobile is loaded to its capacity, one of the poles being 45 feet in length. The chassis has a capacity of 2,000 lb. The wheel-base measures 17 feet, 5 inches, and solid truck tires are used, the front being 2-inch and the rear 6½-inch. The frame is of steel angle section measuring 19 feet, 5 inches from front to rear cross members.

There are 6 cross members, gusseted and riveted to side rails and the truss rods under side rails are of ⅝-inch iron with ends riveted to side rails at front and rear cross member. The weight is 800 lb.

A similar trailmobile has been designed for lumber hauling to carry light loads of 16 ft. lumber. It has a wheel-base of 101 inches with frame of steel angle section having 4 cross members, riveted to side rails. It has a capacity of 2,000 lb. or 1,000 feet yellow pine sheeting, 16′x6″x$\frac{11}{16}$″ and has a weight of 700 lb. The trailmobile may be used behind any automobile, whether pleasure car

FORD AUTOMOBILE No. 5 EQUIPPED WITH SMITH FORM-A-TRUCK.

Placed in Service April 1, 1917.

Operating Record from April 1, 1917, to September 1, 1917.

Month.	Mileage.	Gal. Gas.	Aver. Miles per Gal.	Storage.	Repairs.	Gas and Oil Misc.	Tires.	Total Monthly Cost.	Aver. Cost per Mile.	Days Idle.
April	350	48	7.08	.....	$ 15.05	$ 19.75	.....	$ 34.80	$0.0004	13
May	578	81	7.2	.....	19.98	26.98	.....	43.96	.0743	5
June	452	63	7.17	.....	3.76	26.04	.....	23.80	.0526	5
*July	217	47	4.6	.....	58.01	15.15	.....	73.16	.3371	10
August	694	83	8.4	$1.50	32.06	28.05	$0.90	62.51	.0900	4
Five months April-August	2291	322	7.01	$1.50	$129.86	$105.97	$0.90	$238.23	$0.1031	37

*The averages for the month of July are due to the fact that general repairs were being made to the truck.
Car No. 5 was actually in service as a light truck approximately nine months prior to the addition of the Smith Form-a-Truck attachment.
The figures do not include any depreciation on car or interest on money invested.
Figures arranged and compiled by the Engineering Department.

or truck, on which the rear cross member is available for a coupler, and is made in carrying capacity from 1,250 to 1,800 lb.

In general the standard truck of today is equipped with an engine of sufficient power to pull, over fairly good roads, considerably more of a load than it can carry, and its driving mechanism to the rear wheels is sufficient to handle the entire power output of the engine. Under these conditions the use of trailers consists simply of making use of the truck's latent pulling ability.

In general, tests have shown that the ordinary motor truck carrying its capacity load can pull in addition another load of equal tonnage. These conditions hold true when the roads are fairly level and when the trailer is properly constructed and fitted with truck type wheels, carried on improved types of bearings. Of course, as trucks are used over poor roads with many grades, their hauling capacity is correspondingly decreased.

One important consideration which is not generally known, even among present-day users of tractors and trailers, is the method of distributing the load. Most trucks of today are overpowered and use but a small percentage of that power when traveling over well-paved streets or roads with grades under three per cent. The overplus of power is provided to enable the trucks to negotiate steep grades with full loads or to pull through sandy country, where, of course, the demands made upon the motor are greater than those under ordinary conditions.

The use of a trailer behind an ordinary motor truck at once begins to make use of some of the surplus power of the motor. For this reason it is advantageous to place less than the capacity load on the truck and more on the trailer when the outfit has to negotiate grades or sandy roads. The reason for this is that if a truck is carrying its capacity load it immediately begins to draw upon its surplus power as soon as it strikes the grades and often most of this is required to enable the truck itself to ascend. If, however, less than the capacity load is placed upon the truck, it still retains some of the surplus power to pull the trailer and its load over the grade. In other words, better results can be obtained by loading four tons on a five-ton truck used in connection with a five-ton trailer and six tons on the trailer, than would be the case if the load were distributed evenly on the two vehicles.

The development of the trailer in the future is undoubtedly toward the four-wheeled trailer mounted on rubber tires, especially in the industrial centers. The reason for this is that the four-wheeled trailer permits the load to be distributed over two axles instead of one as is the case with the wagon-like semi-trailer of heavy capacity. While there is undoubtedly a large future for the light two-wheeled semi-trailer as used behind passenger cars and small trucks, the heavy type with steel tires will undoubtedly be restricted due to the damage done to the roads. Loads of 10 tons, carried on one axle with steel tired wheels, exert a tremendous impact when passing over inequalities in the road surface and this impact has resulted in breaking up the foundation of roads with not more than six-inch concrete beds.

Notwithstanding the adverse legislation against the heavy semi-trailer type, the motor trailer and tractor are here to stay and their development will be rapid, owing to the acceptance of the trailer principle by transportation interests generally. The acknowledgment of this principle has now spread throughout the country and thousands of truck owners are reaping the benefits accruing from trailer economy. Aside from the mechanical development of trailers which are lighter than those now manufactured and yet can carry the same loads, the one great feature to be invented is the adoption of some form of automatic trailer brakes applied in conjunction with those on the tractor without additional effort on the part of the driver. These brakes are especially needed when trains of more than one or two trailers are employed. Safety in descending steep grades and in making quick stops on level roads demands an automatic brake.

Co-operative Company in California

Orange County, California, may have a co-operative telephone company by the action of the Pacific Telephone Company to do away with existing free toll exchanges and to charge 10 cents a message toll.

At a meeting of the Anaheim board of trade, preliminary steps were taken to organize the new company. The plan is to cover the county with a network of telephone lines and to give free tolls to all sections. The company is to be operated upon purely a co-operative basis.

A committee composed of John Reuther of Anaheim, Homer Ames and A. A. Mills was named to take the matter before the Associated Chambers of Commerce of Orange County. The board of directors will be composed of men from all sections of the county.

Mr. Reuther stated that he was certain that the railroad commission would not grant any relief in the present hearing and that the only way for the people to do was "to cut loose from the tentacles of the telephone octopus" and organize a company of their own.

Central Indiana Meeting

The Central Indiana Telephone Owners' Association held its quarterly meeting at Lebanon January 22. About forty members of the association were represented. Addresses were made by L. C. Griffets, Seymour; George R. Cranen, Dayton, O.; M. F. Hosea, Indianapolis, and Prof. R. V. Achatz, Purdue University. The operators' school, attended by about thirty-five girls, was conducted by C. E. Doolittle of Terre Haute.

A committee, composed of L. C. Griffets and Prof. R. V. Achatz, was appointed to co-operate with the state association to establish a definite per cent of depreciation that a telephone plant undergoes each year. The offer of Purdue University's equipment in experimental work was accepted by the association.

J. A. Brown of Winchester was re-elected president and M. F. Hosea of Indianapolis secretary-treasurer. The next meeting will be April 16 at Danville, Ind.

Government's Attitute Toward Telephones

Report to Members of the United States Independent Telephone Association

BY VICE PRESIDENT F. B. MACKINNON

THIS report covers briefly the matters that are being considered by various government departments having some jurisdiction over telephone companies.

Telephone Plants Essential Industries.—Informally we have been given to understand that the government was classifying the telephone industry as an essential industry. Formal notice is given in the Fuel Administration order of January 16 directing the closing of factories and suspension of private business for ten consecutive Mondays. By this order telephone companies are classified as third in importance among the essential industries of the country, with precedence over ships, government offices and municipal and state offices. This is a positive indication of the opinion of the government as to the essential character of the telephone industry.

Priorities Committee.—As soon as the railroads were taken over by Director General McAdoo all priorities certificates issued by the Priorities Committee of the War Industries Board were annulled. Therefore, until the railroad situation has been adjusted there will probably not be any further issuance of such certificates.

Interstate Commerce Commission Reports.—The reports for the year ending December 31, 1918, will probably not be ready for distribution before February 15. This applies to all classes of companies. The reason for this delay is principally the congestion at the government printing office. The time for filing the report will be reasonably extended.

Census Bureau Schedules.—Under the law a manufacturer's census has to be taken by the bureau every five years. This is the year for such a census, which includes a census of the telephone industry. Schedules are being prepared for those companies having over $5,000 annual receipts. Those for smaller companies are being distributed. The Joint Committee on Telephone Accounts and Statistics, of which Mr. C. Cragg of St. Paul is chairman, have suggested simplified schedules and more in accord with I. C. C. reports than were used five years ago. Several conferences have been held by the committee and representatives of the Census Bureau with the probable result that many of the company's suggestions will be adopted.

Use of Explosives by Telephone Companies.—Under a law passed last October every user of explosives (gunpowder and all forms of blasting powder or fuses) must secure a license, either a purchaser's license or a foreman's license. A purchaser's license is necessary for the purchase of explosives and having possession of them for use. A foreman's license authorizes both the purchase of explosives and the issuance to workmen who are to actually use them.

The Bureau of Mines is in charge of the enforcement of this law. Under this Bureau there has been established the Bureau of Explosives, etc. Information as to application for licenses will be supplied by the Bureau of Mines, Department of Interior, Washington, D. C. Many county clerks have been appointed licensing officers. Inquiry should therefore be made to your county clerk before looking elsewhere for information.

Tax on Toll Messages.—The necessary blanks on which companies are to make reports of collections of the five cent tax on toll messages have not yet been distributed. As stated in our circular issued December 5 in regard to this tax, blanks for reports will be sent to companies direct from the Treasury Department in Washington. No company should send in its collections to the district collector until it has direct notice so to do by receiving a blank. Every company operating a switchboard, making a record of toll calls and collecting for the same from subscribers of rural lines should report directly to the Collector of Internal Revenue and not through the company owning the toll lines. Companies have until February 28 in which to file reports of November collections.

Income and War Taxes.—Arrangements have been made for securing sufficient copies of the Treasury Department regulations and explanations of the application of these taxes so that all our members will be supplied. With these pamphlets we are sending a digest of the laws which we hope will be of assistance.

Income Tax Circulars.—Telephone companies have been requested by the Commissioner of Internal Revenue to co-operate in spreading information regarding the new income tax law, especially as applied to persons not heretofore subject to it. Companies were requested to print on their bills or separately a notice sent out by the commissioner. In answer to many suggestions that the companies would be glad to insert single slips containing the notice in their envelopes going to subscribers, the commissioner decided to print these slips. Over three thousand Independent companies responded to the commissioner's request with promise of assistance. Such a generous response was most gratifying.

War Savings Committee Co-operation.—At the request of the War Savings Committee having charge of the Thrift Savings and War Stamps campaign we have issued a suggestion to all Independent telephone companies that the industry do everything to aid the committee. We have asked the State Associations to carry out the details of this co-operation. This is a great opportunity for service.

Government Control or Ownership of Telephone Companies.—Owing to the President's decision for the government to take over the operation of the railroads many inquiries have come to us as to the likelihood of a similar decision as to the telephone and telegraph companies. There seems to be no general movement to bring about government control of our industry. The railroad situation was brought about by a falling down of facilities due to congestion of traffic, lack of engine power and dilution of labor. Should the main telephone systems of the country experience such labor troubles as would cause a failure of service, no doubt strong pressure would be brought to bear in behalf of government control if not ownership.

A bill has been introduced by Representative Aswell of Louisiana which provides:

That the President is empowered through the Secretary of War, the Secretary of the Navy, or the Postmaster General, to take possession and assume control of any system or systems of electrical communication, including marine cables, radio stations, telephone and telegraph systems, and to unify and utilize the same, to the exclusion, as far as may be necessary, of all other

traffic thereon for the transmission of military and Government communications, and for such other purposes as may be needful or desirable, and that unification of such telegraph, telephone, cable, radio, and postal services may be made, to increase their efficiency, and release such numbers of trained operators, telegraphers and artisans as may be needed for other and special military and Government services.

The congestion of traffic in Washington with resultant inefficiency of service has caused such talk here of government control of this particular plant. Senator Gore of Oklahoma has introduced a bill providing for the purchase by the government of the District of Columbia telephone system. Those who appreciate the very heavy load the plant here has had to carry do not sympathize with these suggestions. In our opinion, serious consideration will not be given them.

Ask the Association.—Your Association desires to be of the greatest service possible to you at all times and especially now when new problems are arising daily. Do not hesitate to ask us any kind of a question. We will do our best to answer.

* * *

TELEPHONE DIRECTORY COPYRIGHT FRAUD

The Teague Directory & Calendar Company, of Sherman, Texas, through a circular signed by Charles Crenshaw, its attorney, has sent a circular to many of our companies notifying them that the Teague Company has a copyright on all telephone directories, and warns against infringements, threatening suit, etc. This claim is absurd and no one should pay any attention to it other than to keep all such communications from the company and report to us any new letters received and acts of the company.

The copyright referred to in the Teague Company circular covers a telephone directory compiled for the Grayson Telephone Company of Sherman, Texas. The copyright gives the company no rights over any other directory. The form in which matter is printed cannot be copyrighted. Telephone numbers, names of subscribers and their addresses cannot be copyrighted. What else is there to a telephone directory?

We are taking active steps to have the proper Federal officials investigate this attempt at extortion and will follow the matter persistently.

Telephone Call Wire Conflicts

By L. C. Eddy, Jr.

The effect of number of telephone operators and number and length of "A" and "B" operator calls upon call circuit conflicts may be determined by the laws of chance, as follows:

Consider a call to be the depression of a call circuit button, it being understood that an operator is not warned to keep off of the call wire connecting the operators of the two exchanges by hearing another operator talk. (No consideration is given to the case of an exchange having one operator only, for in such a case the operator must wait until she has finished giving one call before giving another.)

First Case. Three hundred calls of three seconds each per hour: There is an equal chance of a call occurring in any one of the three-second periods of which there are $\frac{60}{3} \times 60 = 1{,}200$ per hour; i. e., the chance of one call (and only one) occurring in any given period $= \frac{1}{1200} \times$ the total number $= y$. The chance of two calls occurring in any given period $= y \times y = y^2 = (\frac{300}{1200})^2 = (\frac{1}{4})^2 = (.25)^2 = 6.25$ per cent. The chance of three calls occurring in any given period $= y \times y \times y = y^3 = (.25)^3 = 1.562$ per cent. The chance of c calls occurring in any given period $= y^c$. The chance of the entire 300 calls occurring in any given period $= y^{300}$. The chance of there being over one call in any given period = the chance of conflicts = sum of these chances $= y^2 + y^3 - y^{300}$ providing there are enough operators to give 300 simultaneous calls. If there are only two operators in an exchange, no more than two calls at the same time can occur, the probability of conflict, therefore, $= y^2 = .25^2 = .0625$ = ratio of conflicts to total number of calls, or conflicts = 6.25 per cent. If there are three operators either two or three calls may occur at the same time and the probability of conflict $= y^2 + y^3 = .25^2 + .25^3 = .0625 + .01562 = 7.812$ per cent, and so on, up to 300 operators, but when the number of operators exceeds nine a further increase in the number of operators does not appreciably affect the probability of conflicts (providing three hundred calls are made per hour), the probability being 8.338 per cent.

Second Case. Calls per hour $= c$; fractional part of an hour occupied by a single call $= f$. The ratio of conflicts to total number of calls (deduced by same method as in first case) =

$(cf)^2$ in exchange having 2 operators only.

$(cf)^2 + (cf)^3$ in exchange 3 operators only.

$(cf)^2 + (cf)^3 + (cf)^9$ in exchange having 9 operators only.

$(cf)^2 + (cf)^3 + (cf)^n$ in exchange having n operators only.

The chief items of these results have been checked experimentally.

Click Knocks Her Down

Lizzie Ledgerwood of Omaha alleges she was knocked down by a blow on the left ear delivered by the Nebraska Telephone Company through the telephone receiver.

She says she answered the telephone at the home of Mrs. Susie Hartnett, her daughter, and on putting the receiver to her ear there came out from it a loud report and a vibrant shock of sound of such physical strength as to throw her to the floor.

She sued the telephone company for $5,000 damages, alleging that it was testing the line when the bell rang and that the blow on the ear caused her to lose her hearing. The case was settled for $100, according to her attorney.

Japan Makes Many Calls

There are more calls made per telephone in the city of Tokyo than in any other country according to the *Jiji*, a Japanese daily paper. This is no doubt due to the scarcity of telephones and the practice of charging a uniform rate. There are only 231,000 instruments in Japan. The number of telephones per 100 inhabitants is .4 in Japan; 10.0 in America; 1.5 in England; 2.0 in Germany, and .65 in Canada. The number of calls per telephone is given as follows: Tokyo, 19; America, 12; Germany, 4; France, 3.5; England, 3.

Shunts or Short Circuits

How many fellows are locating their opens with the test receiver by this time? How many fellows are still calling into the test table and asking, "How do you get it now?" I know *one* that is not doing it, says James Stewart in *The Mouthpiece;* he came to me the other day and told me so, and then he proved it by locating his next case of trouble with his test set, and I went with him so he could show me that he was able to do it. The man had accomplished something and was glad of it; he brought himself to my attention because he knew he had developed into a better man and was proud of his attainment.

We will show you the routine you should go through to located a shunted condenser in a straight ringing or bridging telephone.

Figure No. 6 shows a common battery circuit of a straight ringing or bridging telephone; please notice that the path of the circuit is open at two points; A, the hook switch contacts, and B, the condenser. The circuit is only open to direct current, or the current used for signaling the operator; direct current cannot flow through the open switch contacts "A" and the condenser "B" is practically the same as the switch hook, because there is

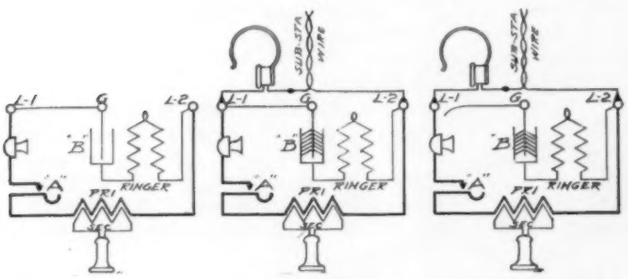


Fig. 6 *Fig. 7* *Fig. 8*

no metallic contact between the two terminals of the condenser. Alternating or ringing current, however, will pass through a condenser and the central office is able to call the subscriber.

So the condenser is placed in series with the ringer coils to hold the circuit open, because it is necessary to have the ringing circuit across the line so that the subscriber's station can be called, and if the ringer coils were placed across the line without the condenser in series, the circuit would be closed, or shunted, and the operator would get a permanent signal. The same thing happens when a condenser becomes short-circuited from any cause.

How do you go about locating the cause of the permanent, after the test table operator has told you the line is shunted?

I would be sure I had received sufficient information, such as the cable pair, location of the terminal, etc., and correct name and address. My first call would be to the station, unless the cable terminal was closer and handy to get at. Fig. 7, my first operation would be to remove one of the line wires from the telephone, in this case L-1, and I would then fasten one end of my test receiver to the *wire I had removed,* and fasten the other side of my test receiver to the post *L-1 from which I had removed the wire.* The condenser being shunted, I would get a click in the receiver as the current would flow from the wire I had removed, through the receiver to post L-1, over strap to post G, through the (shunted condenser) and ringer coils to post L-2.

There is also a possibility that the hook switch springs may be shunted, so I will remove the strap from post L-1 (Fig. 8), which opens the circuit through the shunted condenser and I will not get the click in my receiver, proving that the shunt is in the condenser. *Try it.*

Visible Sound Waves

In *L'Astronomie* for July, 1917, are published three letters from different places near the war front describing the appearance in the sky of rapidly moving, parallel arcs of light and shade, seen at times when violent cannonading was in progress. In one case the moving bands were seen on a cloud by all the members of a battery of artillery. The description states that they moved with the speed of sound waves and their appearance coincided with the successive discharge of particular mortars. The space between the bands was greater for large than for small cannon. Apparently their visibility, which lasted altogether about ten minutes, depended upon particular relative positions of the observer, the cloud, the cannon and the sun. In another case, described by a French curé, the phenomenon took the form of slender bands sweeping over a blue sky interspersed with clouds. They were seen about halfway between the northern horizon and the zenith, and their shape was that of arcs of circles of very large radius. In this and the previous case the observers compared the circles to the concentric ripples produced by dropping a pebble in water. The air was calm. In the third description the observer compares the lines, moving across the sky, to the spokes of a gigantic wheel. Two of the writers correctly attribute the phenomena to sound waves; *i. e.,* alternate rarefactions and condensations in the air in the form of spheres of progressively increasing radius, of which the observer sees the projections in the form of circles. The optical phenomena involved in the production of such rings were discussed a few years ago by F. A. Perret in his description of the analogous "flashing arcs," seen in connection with volcanic eruptions.—*Scientific American Supplement.*

Fire Advice by Telephone

That the telephone will be used as a fire fighter in the near future is the opinion of Fire Chief Cody of Atlanta, Ga., and officials of the Southern Bell Telephone Company are much interested in the possibilities of the plan. It is a well-known fact that an experienced physician can ask a patient a few questions over the telephone and write a prescription that will cure him unless he is seriously ill with some malignant disease. In the same way Fire Chief Cody figures that an experienced fire-fighter can ask a few questions and give directions on how to locate and fight a fire in a house beyond the reach of the department. The idea applies only to houses in the suburbs having no fire department and to houses in the country. Recently a house some ten miles from Atlanta caught fire. The owner called the local fire department and told them he couldn't locate the blaze. The chief, after asking a few questions, told him to rip up his hearth and he would find the hearth box on fire, which the owner did, and saved his home.

Telling the Public

William C. Bamburg, of the publicity department of the New England Telephone & Telegraph Company, talked Thursday evening, November 22, to the employes of the Lowell, Mass., exchange district about "Telling the Public." The purpose of this talk was to inform the employes concerning the efforts now being made by the company in developing a better understanding between them and the telephone using public. Such an understanding is probably more necessary in the use of the telephone service than in the relationship of the public to any other public utility which is used so liberally in daily life.

"The illustrated lectures which Mr. Bamburg will talk about are the best means of telling the public about the efforts we have to make in establishing and maintaining telephone service, and the things which they must also do so that our efforts may not be wasted," said Manager Leathers in introducing the speaker, "We feel that a better understanding of our problems by telephone users results in better and pleasanter relations in our every-day life, and it is to further these relations that we are making arrangements for these lectures."

In describing his work and the preparations which are necessary to equip any manager in the New England territory to make such an address before a women's club, or a high school class, or a mens' club, or board of trade or as an entertainment at a fraternal meeting, Mr. Bamburg cited some amusing experiences of the lecture platform.

"One thing about the opportunity and the manner of telling the people about the service must be carefully defined," said Mr. Bamburg. "You must not think that there is any advertising in these lectures, for we are not advertising telephone service nor toll service, nor any kind of equipment at all. The story which we are telling in our lectures is full of simple and understandable descriptions of the telephone plant and the equipment of the central offices, and the wonderfully intricate construction of underground cables and overhead circuits.

All of you realize how little people know about the work you are each doing individually, and when you realize how just a little description of the details of your own personal work or the work of some other employes will interest the listener in the telephone work, you will appreciate how easy it is to clear away misunderstandings and how important it is that this educational work be carried on.

"Are you ever doubtful whether our business is interesting? Begin to talk about it, and see how soon you are enthused, and how eager you are to have the stranger understand you. Are you doubtful about any criticism of service someone has made to you? Begin to try to satisfy the mind of that critic and see how earnest you are in your explanation of the facts and the assertion of the truth. And, if there is a technical point—or, for that matter, anything at all about our business that you do not yourselves know—observe how soon you are on the way to find someone in the company who will be able to tell you all that you need to know about it.

"I believe that every subscriber should be induced in some way to learn the ordinary rudiments of the service, just to ensure the prevalence of the voice with the smile in it in all telephone conversations. You grils know how well the subscribers are satisfied with the service when they understand your various moves in the routine of a call, either local or toll, and I think that we telephone people, who are the most critical of our own company's service, are the ablest users of it because we are cognizant of each move in the setting up of a connection.

"You believe with me, I know, that the telephone employe is the best natured individual there is in almost any business, for there are no persons catering to the wants of the people who are on such a human mission and who must at all times remember the humanity of the service and the human results of the service, as does every one of us in the telephone business. That may be patting ourselves on the back, but, when a user of the service first realizes the standardization of our work in every branch and sees the necessity for that standardization, he must know that the most intensive thought is put into the executive direction of our employes, and that everything we do has its foundation upon the desire to perform the most efficient work at all times.

Proposed Substitutes for Platinum

In *Commerce Reports* for May 2 reference was made to a palladium-gold alloy named "palau," which compares favorably with the platinum-iridium alloy used by chemists for crucibles, dishes, etc. Additional alloys, with varying proportions of gold and palladium suitable for the chemists' use are described in the June number of the *Journal of Industrial and Engineering Chemistry*. The name "rhotanium" has been given to those alloys which have a gold content of 60 to 90 per cent. Briefly summarized, their properties and applications are said to be as follows:

Rhotanium is not suitable for use with hot concentrated nitric acid nor for electrolytic anodes, but for all other chemical purposes it is entirely satisfactory if proper composition is chosen and if properly manufactured. Losses by volatilization at temperatures below 1,300° C. are less than for commercial platinum.

Rhotanium is malleable and ductile, and can be welded with the use of a flux or other reagent. The specific gravity ranges from about 16 to 18.5, according to composition.

It can be used within its temperature limitations in electric heating units. Its high resistance and low temperature coefficient are valuable in this connection. It is satisfactory as material for contact terminals in many forms of automatic electric devices and may be used in this capacity on certain types of telephones, switchboards, signal devices, lighting and ignition systems, and in most other cases except where it has been found necessary to use a high percentage of iridium alloyed with platinum. Its behavior when tested on certain magnetos was satisfactory, but other experiments performed on a high-grade aeroplane-engine magneto gave negative results.

Certain of the alloys have given good service in dentistry when used for pins and baked into porcelain teeth and as thin foil and heavy sheet for other types of construction.

Rhotanium is said to be superior to pure platinum for use in jewelry. It is harder and stronger and takes a better finish. It does not tarnish, is non-corrodible, has practically the color of platinum, and can be worked as readily as platinum. Jewelry made with it passes the common jewelers' and platinum buyers' tests.

It is not clear from the article cited that there may not be small amounts of rhodium or iridium in these alloys. Several comprehensive tables of tests are given in the paper.

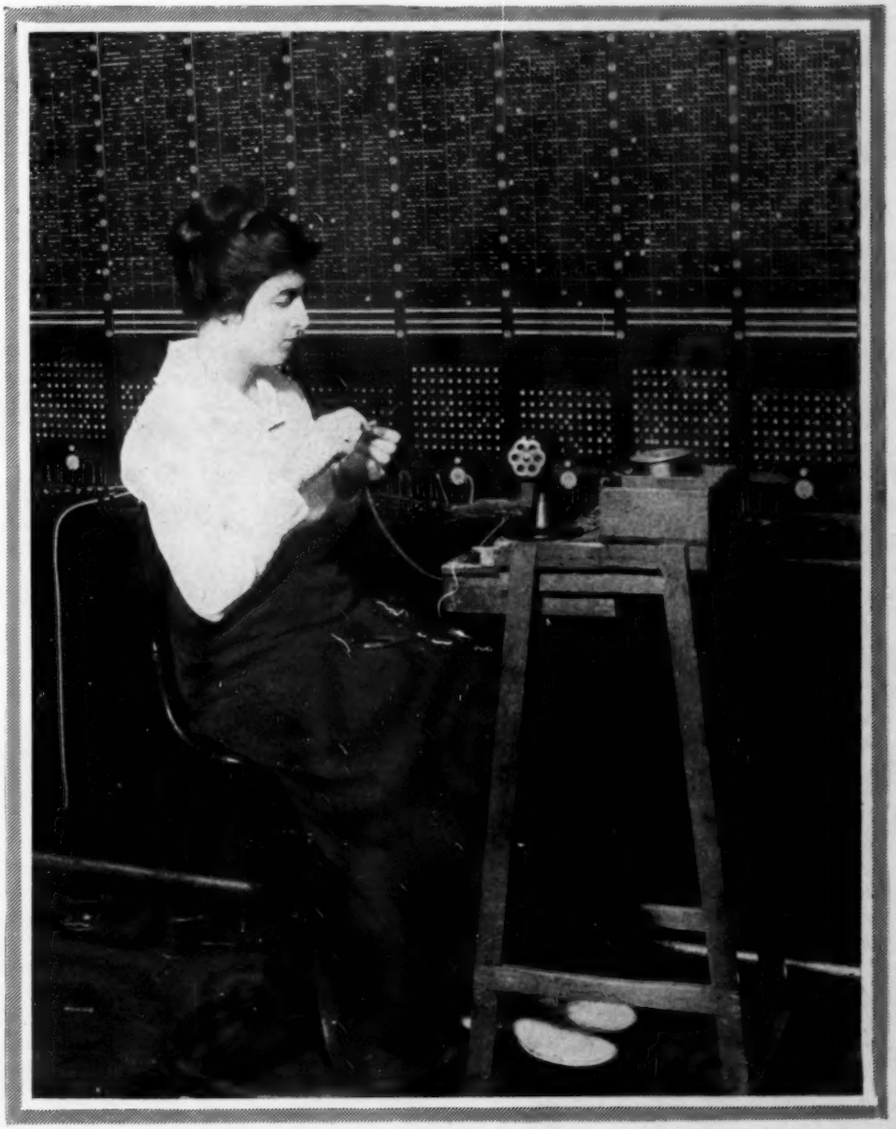
Women as "Telephone Men"

Southern Telephone News Cites Successful Examples

IT was to be expected that women would be gradually brought into the organization to do the work formerly done by some of the men who have gone into military service. However, no one dreamed that women could be induced to do the work of plant men, or that they could do it effectively when put to the test.

All doubts have been dissipated by actual conditions, and at least two young women are doing mechanical work in central offices of the Southern Bell system—work which it was believed must necessarily be done by men. They are doing the work well, too, and their success means that another avenue of endeavor is opened up for women.

It doubtless required courage for Miss Mason at Montgomery and Miss Gilpen at Birmingham to pioneer in this work. Each felt a desire to do her "bit" and each felt that in filling the place of a soldier in such an essential industry as the telephone business, she would be truly serving her country.



Myrtle Gilpen, Cord Repairer, Birmingham Plant, Southern Bell.

"MAN'S WORK" IS EASY, SAYS MISS MYRTLE GILPEN.

When I began work for the telephone company, October 19, I knew my work was to "repair cords." I had no idea what kind of work it was or how it was done. I was surprised when I went into the operating room and had my task explained to me and found it so easily done.

My work is practically the making of new cords out of those which by constant use have become worn and frayed. I do this by taking off the plug and cutting the cord back. Each cord contains three small wires—one for the tip, one for the ring, and the other for the sleeve of the plug. I wrap the wires and then with a small machine with which I do my work I place the cord back in the plug, connect the wires, and it is ready for use again.

At first it took me a long time to repair a cord; now I can repair one every five or six minutes. I take my little machine and go up and down the board. Everybody looks at me, but I feel that my work is just as important as that of the operators.

MISS MASON IS PATRIOTIC.

Miss Mason was too busy to write her experience, but she says that while she is not allowed to wear a uniform and shoulder a gun, she can at least take the place of a man who has gone. From the enthusiastic and intelligent manner in which she is taking hold of the work she will no doubt do well the job of the soldier whose place she has taken.

In the picture she is shown clearing a case of central office trouble, at which she is becoming quite expert.

* * *

WOMEN MAKE GOOD AS "PLANT MEN," L. V. METTS SAYS.

What? A young lady on plant work? It cannot work out, for many reasons. So you think; but it did. We all probably had our doubts until it was put to the test, and on this particular test we found the results absolutely satisfactory and proving more so each day, or rather night, as this "lady plant man" works on the night trick.

Do you know what a switchboard cord is? Did you ever think what they mean to the company? Oh! you knew we had to use cords on our switchboards to properly connect subscribers for talking purposes, and probably you knew or thought they should be a certain length in

order to reach each multiple in the board, but that is as far as some of you have considered them.

A switchboard cord is a very expensive part of the equipment, and it is subject to troubles the same as any other part, and by reason of its being used so often it possibly develops more troubles than any of the other parts; therefore it is necessary that it be made of as good and as serviceable material as can be secured.

The ordinary switchboard cord is made up of three conductors insulated from each other and with a very heavy covering over the three with a still heavier covering or reinforcement extending back from the end on which the plug is connected for about twelve inches; the other end has tips connected to them for the purpose of connecting the cord to the cord fasteners.

After being in use for some time the cords begin to wear, or as we say, "become frayed," just behind the plug, and as this frayed part would soon wear through, the cord being perfectly good otherwise, additional use is gained by cutting off the plug, adding new connections to the cord back of the frayed part and then reconnecting to the plug.

Usually it is necessary to cut off about an inch or an inch and a half to make proper connections, and this process can be repeated almost to the end of the reinforcement mentioned above.

To take the cord out of the board and replace it with another and then repair the cord or send it to the factory to be repaired costs much more than repairing the cord in the board, and for quite some time we have been making these repairs in the board.

Now that our country is at war and the government is making such demands for experienced telephone men for the Signal Corps, on this job where we have heretofore been using young men, we decided to try a young lady on the work.

We picked an intelligent young woman, who from her past experience seemed promising, as a trial, and started her in with the best of instruction and practical demonstrations.

The first night she did not get many, but the quality of her work was of the best, and we could tell that with an increase in speed she would "make good."

She started to work on October 19, and in less than two weeks she had attained a proficiency equal to our best expectations, and the quality and speed sufficing to cover all repairs each night and still make repairs for cords coming in from the branch offices.

In our Birmingham main office we have something more than 3,000 cords in use daily, and as our traffic is very heavy, the cord-repair item is a very heavy one, and as this repairing means a big saving in real money to the company, the work is most important.

The repairs will compare most favorably with that done by the shops, and is of the "made in Birmingham" type.

Cross Talk Suit

When a telephone operator cuts in a third party on to a quiet tete-a-tete going on between two other persons, is the telephone company liable to damages? This interesting issue which has been pending in the Rockingham county, N. C., courts for five years was brought before a jury at Wentworth, but it could not agree and a mistrial was ordered.

The action is brought by Job B. Faulkner against the Southern Bell Telephone Company, the action to recover $3,000 being instituted in October, 1912.

The plaintiff complained that he was a subscriber both at his home and at his restaurant to a telephone and that during the month the plaintiff was engaged in a conversation over the telephone at his restaurant with a lady about a matter of business and that while in the midst of the conversation one of the operators in the central telephone exchange in Reidsville suggested to the plaintiff's wife, Mrs. J. B. Faulkner, that he was engaged in an improper conversation with the lady at the other telephone and suggested that Mrs. J. B. Faulkner listen to the conversation and thereupon the said lady telephone operator connected the telephone in plaintiff's residence to the line over which the plaintiff, J. B. Faulkner was speaking, in order that Mrs. J. B. Faulkner might hear the conversation. He also complains that Mrs. Faulkner listened to the conversation and that on account of the suggestion being made and the connection of the telephone lines the plaintiff's wife became furious with him and charged him with infidelity and withdrew conjugal relations with the plaintiff and that the plaintiff suffered in humiliation and in his feelings and in the loss of society of his wife to his damage in the sum of $3,000.

The defendant denied the allegations of the plaintiff absolutely and completely and stated that nothing of the kind ever happened.

The jury, after deliberating over the evidence, were unable to agree, so a mistrial was ordered by the court.

Automatic for Buenos Aires

The question of the automatic telephone concession applied for by Senor Alex. Schwimmer came up for discussion at the meeting of the Buenos Aires Municipal Commissioners recently.

It was decided to refer it back to the intendent (mayor) with a request for information as to whether the automatic telephone system would give satisfactory results as a public service in the city of Buenos Aires; the possibility and desirability of municipalising the service; or whether it is desirable that the service should be exploited by third parties, by a sole and exclusive concession or by the grant of permits; and in the case of an exclusive concession being contemplated, whether it is desirable to accept either of the two proposals presented (by Messrs. Schwimmer and Jurado respectively) or whether it should be decided by public tender; and what would be the legal situation of the existing telephone companies in the event of an exclusive concession being granted for an automatic service.

Preventing Overloading of Patrol Line

A novel arrangement is employed by the Pacific Power & Light Company on its telephone line along the Naches Canal to prevent overloading the line, says J. W. Swaren, in *Electrical World*. A telephone instrument is mounted in a small wood cabinet at each mile pole. The service leads terminate at one pair of terminals of a single-throw, double-pole, "baby" knife-switch, and the instrument is connected to the other terminals. This switch is mounted on the inside of the cabinet in such a position that a wood lug fastened to the cabinet door strikes the handle when closed, thus cutting the telephone off the line. This simple arrangement, which was devised by J. H. Siegfried, superintendent of power of this company, effectually prevents a common fault of patrol lines, that of leaving the telephones in circuit.

What the Night Operator Hears

A few weks ago, says a telephone exchange manager in a small town, I played the role of night operator. I believe that every man who has to do with the business end of a telephone company should learn to operate a switchboard. I do not mean that he should sit at the board when fancy strikes him, but that he should take a regular trick and work as a regular operator. He will see something of the telephone game that he never saw before in his most reckless dreams. He will hear himself discussed in many ways, both good and bad. He will hear one man falsely blame the operator for failure to get another party when the first party had never called at all. He will get the "rubbering" as it really exists. He will beard the lion in its lair. He will also incidentally learn who is doing the talking, the so-called business man or the rural folk. My experience showed that nearly all calls on the town section of the board ceased after seven o'clock in the evening, residence and business alike. Here and there an occasional call but the greater part of the time not one connection was up. Nearly every rural line was busy until ten o'clock. A few kept it as late as eleven. The last cord connection was taken down a few minutes after that hour and I went to bed as most rural operators do when they get a chance. About the time I "hit the hay" the night bell tore off a noise that indicated a hurry call. I ran to the switchboard and answered. He only wished to know the time of night. Five minutes later I was called again and when connection was established the party told the answering party that he was about ready to start home, a distance of about a mile. A few more similar calls and at last the man arrived home and had to call up the party with whom he had spent the evening only to tell him that he had arrived home. And so the story goes. I am not complaining because I had to remain up most of the night to answer rural calls; nor am I objecting to the free use of the telephone by every patron, but I am laying stress on the fact that in almost every small exchange, if rates were made according to service used, the rural subscriber would pay the business rate and the average business man as now listed would pay the lesser rate. A business man is content to begin the use of the telephone after seven o'clock in the morning but the rural subscriber begins by asking the time of day at four a. m. I could relate a hundred similar cases, all within the scope of a day's business, but what's the use? I find no fault with the farmer. He is getting as much as he can for his money, and he really believes that the telephone company is fattening at his expense. But I do believe that some move should be started to awaken him to the fact that he owes his present exalted position to the telephone, and that he should pay a rate in keeping with the prices which its use has brought to him for his products.

Telephone Work in Battle Area

Information regarding telephone work at the front comes from Mr. R. A. Storey, formerly of the engineering department, British Columbia Telephone Company, who went over with one of the signaling contingents. He tells, in *Telephone Talk,* some interesting things of conditions there:

In France they now build permanent lines up as close to the front as they figure it pays to build them. That is, till the shells get too thick to make it worth while. From there on they build semi-permanent air line for a piece, and lastly bury cable about seven or eight feet deep. The laying out of the lines is not greatly different from our schemes, but they always lay them out so as to have at least two routes, so that in case one goes out they have another. There is also a type of air line put up at the rate of a mile an hour on fairly rough ground. A wagon carries poles and all necessary materials, and eleven men from the gang. This has to be used sometimes in emergency, where only a single line is required, but required at once. It was used a good deal in South Africa, but not so much in this war. Here they required forty or fifty pairs usually. The air line is about the last thing the most of the fellows get into here before going to France, but just now they seem to need linemen, and if a man looks as if he could climb a pole he gets on the air line right away without doing any flag-waving at all.

A man who is a lineman or has some idea of how the work is done certainly can handle this stuff without any trouble. You would take a fit if you saw these spurs. They remind me of a rooster's spurs. There were a dozen pairs in the stores that the sergeant would not let us put on for fear of breaking our necks. He has a pair of his own here he got from Canada. Things are just about fifteen or twenty years behind in the telephone business. One day we were out putting up a line, partly for training, partly for use. They started us out with short-handled shovels and a few crowbars (of the ordinary pattern).

There are a lot of funny things a fellow sees, if he keeps his eyes open. One of the instructors, who was a lineman from Manitoba and is back from the front, says that he will back the one Canadian air detachment in France against any of the Royal Engineers detachments. He says he has seen them work on similar work and knows what they can do. The Royal Engineers use ladders to climb the poles with as much as or more than spurs. Safety belts are an unknown thing, except that they sometimes take along a strap like a trunk strap and buckle it around themselves and the pole if they have to be up a long time. Nearly all the men on regular air line work in France send back for their tools. You ought to see the pliers. Connectors don't mean anything to them here. Of course, these tools are only of use on the lines fairly well back, but still they have to be kept up, and as advances are made they have to be extended on. For buried cable they usually use two-pair cable rubber insulated and armored, and put in enough cables to make up the pairs required (probably twenty-pair cables). I asked why they didn't put in one lead-covered paper-insulated armored cable, and the sergeant said he had suggested that but they were afraid they could not get splicers to splice it.

Southern Railway Discards Telegraph

Displacing the telegraph, the telephone is to be used for dispatching trains on the entire line of the Southern Railway System between Washington and Atlanta—649 miles.

Between Washington and Spencer, N. C., the telephone is now in use and authority has just been given for the construction of two copper telephone circuits between Spencer and Atlanta, 314 miles. Gangs will be organized and this work will be performed under the jurisdiction of the superintendent of telegraph at Charlotte.

When this work is completed, the Southern will have continuous train dispatching and message circuits between Washington and Atlanta and these two circuits will also provide a third or phantom circuit for talking purposes and a simplex telegraph circuit between the offices at Washington, Atlanta, Charlotte and important division and junction points, such as Monroe, Va.; Greensboro, N. C.; Spencer, N. C.; Hayne, S. C., and Greensville, S. C.

The telephone has several advantages over the telegraph. Service is quicker and it is easier to guard against errors. The dispatcher writes the order as he sends it, spelling out all figures, such as train numbers, engine numbers and time. The receiver writes the message as he receives it and then repeats it to the dispatcher, spelling out all the figures. The telephone brings the sender and receiver into close touch and the dispatcher, should occasion arise, can talk personally to the conductor or engineer of any train on his division.

In Japan

In an article entitled "Japan Amazes and Amuses," by Eleanor Franklin Egan in the *Saturday Evening Post* there appears the following reference to the telephone and telegraph service in Japan:

Among the many government monopolies are all the telegraph and telephone services, but these are not included in the general statement of increased revenue. They show an increase of two million five hundred and seventy-four thousand yen all by themselves, or a total revenue of more than fourteen and a half millions for the first half of the present year.

Yet Japan has the worst telephone and telegraph services in the world, without a single exception, that I have ever encountered. It is rather astonishing, too, because I remember when the people were very proud of these systems, and with some degree of reason. But they are government owned; the government has had other use for its money and it has "let well enough alone" until "well enough" is antiquated, not to say utterly demoralized.

To get a telephone installed takes anywhere from one to three years, and even so it can only be done through a telephone broker, who charges as much as a thousand yen for the instrument, the use of which in most countries is free to the telephone subscriber and the property of the telephone company. Conditions are so bad that even a modified statement of the facts sounds like a gross exaggeration. And during a period like the present, too, when time is money and the telephone an indispensable part of every business man's equipment, private telephones are naturally a luxury that only the very rich can afford.

According to the latest Japan Year Book the number of waiting applicants for telephones at the end of March, 1915, was one hundred and forty thousand. Each of these applicants having deposited with the bureau of communications the required sum of fifteen yen, that bureau held in trust on this account more than two million yen. And some of those applications are yet to be filled!

A tremendous increase in the demand for telephones, due to the speeding-up of industry and the establishment of thousands of new enterprises, has resulted in a state of affairs wherein the successful applicant is entirely at the mercy of the telephone broker, who, without let or hindrance from the authorities, is able to sell his instruments to the highest bidder.

And at that a telephone represents a minimum of usefulness even after its owner has broken his nerves in an effort to acquire it. The operators are, almost to a unit, incompetent and indifferent. In many instances they are impertinent as well, with an impertinence peculiar to the poorly paid but insufferably conceited minor government servant of Japan. The populace grinds its teeth.

From Yokohama to Tokio it is just eighteen miles; Yokohama is the principal port of the country, with a population of four hundred thousand; Tokio is the capital, with tremendous business interests and a population of more than two millions. Yet New York can get San Francisco on the long-distance telephone in less time than it takes Yokohama to get Tokio.

I had an engagement one day to lunch with some friends at the Imperial Hotel in Tokio, and along about ten o'clock that morning more important matters presented themselves which made it impossible for me to go. I knew it would be quite all right if I telephoned a message to my hostess, so I went to the switchboard at my own hotel in Yokohama and asked the operator to get me the Imperial. Only eighteen miles away, mind you; and telephone connection asked for between the two biggest and best hotels in the empire. Just then the manager of my hotel came along.

"You don't mean to tell me you are trying to get Tokio on the telephone!" he said.

"Yes; why not?"

"No reason at all," he replied, "if you happen to have the day to spare."

"But I haven't. How long will it take?"

"Oh, not more than two or three hours if you're lucky. But it would be much quicker to send a telegram."

All right. I accepted his advice, wrote out my telegram and handed it to one of the clerks in the office. When he saw what it was about he scratched his ear in a thoughtful kind of way and volunteered the information that it would probably not be delivered in time.

"Better send it special," he said.

"What do you mean, 'special'?"

"You pay a double rate and get the right of way over ordinary telegrams."

I paid the double rate, which amounted to three yen—one dollar and a half—for fifteen words, including the address and signature, and my telegram was delivered to my very much annoyed hostess at three o'clock that afternoon! Suppose it had been a confirmation of a business deal for an option on which I had paid a large sum and which expired at two o'clock? That is what the business man in Japan is up against.

Yet the Japanese Government, any member of which could make himself a popular hero by raising merry Ned about all these domestic shortcomings, including the execrable railway services and certain iniquitous monopolies, such as the salt monopoly, the tobacco monopoly and a number of others that serve to bleed white the poor of the country and to make their simplest necessities almost prohibitively dear—the Japanese Government concerns itself almost exclusively with matters relating to the country's international status, with war, the cost of war and the spoils of war.

Japan will profit as much as any country in the world by a peace that no nation will be permitted lightly to break.

Campaign Cards on Poles

During election time the pictures of the various candidates begin to appear, and are tacked to the telephone and light company poles. There are plenty of good reasons why this should not be done, and it is time the public waked up to them. It is an unsightly thing to have all the poles along our streets decorated with a medley of cards of all sorts. They make no impression upon the minds of the voters, and so far as their effect in making votes is concerned they might just as well not be there. They are there, too, in violation of the regulations, and it is a mighty poor commentary on the promises of the candidates for the best government that ever was for them to begin by disobeying a rule for their own benefit. But more important than all that, the practice is dangerous to human life. The tacks that hold these smiling faces up to the gaze of passers by are most tenacious, and long after the election is done and the pictures of winners and defeated alike have been gathered into the limbo of departed paper these same tacks remain. Along comes a lineman intent upon his business and starts up the pole. He may get up all right, but when he comes down he cannot see so well and his spur strikes the head of one of the tacks, slips and the man either wrenches himself seriously, or else falls and is badly hurt. There have been so many instances of this sort that the companies are compelled to send gangs of men to try and get all the tacks out of the poles. It is distinctly a wrong thing for these candidates to do and it ought to be stopped. There are plenty of bill boards and shop windows. Let the poles alone.—Wilkes-Barre, Pa., *News*.

Capital on Strike

"Capital has gone on strike. Men with money want to be assured of reasonable protection. If we can't get it, you'll get no more of our money.

"You will give us a fair return on our money invested or the state or municipalities will have to take over the trolley lines and operate them. We have been sandbagged, blackmailed and criticised long enough. We'll be the goats no longer. We have been furnishing transportation for less than cost.

"The five-cent standard fare was the original as regards the street railways. Instead of doing what a manufacturing company does, namely, regulating the selling price to the cost of production, street railway companies adopted a uniform rate.

"Unfortunately the public has believed that, no matter how much the cost of supplies increases, no matter how much wages increase, no matter how much taxes increase, there shall be no increase in the charge for carrying a passenger."—President P. F. Sullivan of the Bay State Street Railway Company.

Loading Coils versus Repeaters

Properly Designed and Correctly Installed, Loading Coils Are Adequate for All Long Distance Work

BY W. N. FURTHMANN

IN previous articles in TELEPHONE ENGINEER on loading coils and repeaters the discussion has shown that the difference of impedance of two telephone circuits or sections it is proposed to join causes reflection losses in telephone transmission. Losses of this kind are present whether in sections that are composed of loaded or non-loaded conductors. In loading a telephone circuit it is necessary to consider these losses, as they vitally effect the amount of current that will be received at the end of the line. Since loading coils are fundamentally required to insure a sufficient amount of current at the receiving end of the line, it follows clearly that terminal transformers should be employed in the common cause. Terminal transformers of high efficiency are certain to contain some transmission loss. The problem involved in their use therefore requires careful analysis. They cannot consistently be used where their inherent loss is greater than the good they are to accomplish.

In contemplating the use of a repeater the important factor of a terminal transformer cannot be cast aside. It has been claimed that the additional current a repeater relay adds to a line causes the reflection losses in a telephone circuit to be considered a negligible loss. Since mathematical data have not been furnished as yet to prove in any claims of the necessity of repeaters, even in a transcontinental line, it is somewhat difficult to allow this one.

Fortunately we have at hand data in the form of patents that show on their face that terminal losses were not considered in the original invention of a repeater as discussed in the January issue of TELEPHONE ENGINEER. It will be noted, however, in considering the Shreeve patent, No. 835,037, dated November 6, 1906, applied for January 24, 1906, that the inventor has discovered that differences of impedances in two sections it is proposed to join cause the repeater to sing or howl. This condition makes a repeater impracticable and must of course be remedied. The writer, as a matter of argument, calls to the interested reader's attention at this point that in the Shreeve patent No. 791,655, dated June 6, 1906, and applied for July 8, 1904, it was specifically claimed that the relay described could be used to obtain the "capability of retransmitting the message at any convenient intermediate point of the circuit or chain of circuits extending between the original transmitter and the ultimate receiver with renewed energy and without sacrifice of quality, etc." Why this very interesting condition was claimed in the original patent of 1905, and all reference to reflection loss omitted, being pointed out as a defect in the succeeding patent, is difficult to fathom. The more so, perhaps, since previous patents of Dr. Pupin dated in 1900 and assigned also to the same assignee, the A. T. & T. Co., specifically pointed out the importance of this factor from a transmission standpoint.

In order that no argument may occur in this connection the exact wording of Dr. Pupin's invention covering the design of loading coils is quoted, as follows:

"It is easily seen that in loading a high resistance telephone cable the lower resistance limit will be approached, and in loading a low resistance air line an approach to the upper resistance limit will be reached."

Dr. G. A. Campbell in his patent issued October 25, 1904, applied for March 5, 1900, and also in his patent No. 729,709, dated June 2, 1903, applied for March 19, 1902, brought out the importance of considering reflection losses. It should be remembered in this connection that both of these patents were also assigned to the A. T. & T. Co.

The wording of Dr. Campbell's patent of 1903 is clear, concise and well considered and as a matter of illustration is quoted as follows:

"It is now well known that when an electric wave or a train of electric waves travelling along a heterogeneous circuit passes from one portion of the circuit having a well defined character to another of diverse characterization a reflection of the waves occurs at the point of heterogeneity and the reflected waves tend to travel back to their place of origin instead of proceeding to the farther end of the circuit."

It will be evident that Dr. Pupin and Dr. Campbell were in accord. The point of heterogeneity as described by Dr. Campbell most assuredly exists between an aerial and cable conductor, as pointed out by Dr. Pupin.

It is not the purpose of these articles to criticise any of the mechanical or electrical features of any repeater. It is rather the purpose to show that repeaters are not required for good long distance transmission. In order that a comparison of the Shreeve patents of 1905 and 1906 may be made as to reflection losses a summary of the important claims in the patent of 1906 reads as follows:

In systems in which a relay or repeater circuit is arranged similarly to a Wheatstone bridge—such, for example, as that described in my Patent No. 791,656, dated June 6, 1905—it is important that the electrical conditions in the main line upon opposite sides of said relay-circuit shall be substantially the same. If the impedance of the sections of the main-line circuit or independent lines constituting such a circuit is materially different, induced currents may flow in the bridge connection and produce a "singing" in the relay. Moreover, the difference in impedance tends to alter the phase of the currents in the main-line sections, interfering with transmission.

The principal object of my invention is to provide means for so balancing lines of different character and dimensions that these difficulties may be overcome.

The invention consists, more essentially, in the inclusion in a main-line telephone-circuit and associated with a bridged relay of means for altering the electrical conditions or properties by adjusting either the resistance or capacity of said circuit, the arrangement being such that these agencies will most effectively perform their functions.

In the accompanying drawings, in which like characters designate like parts throughout both views, Fig 1 shows diagrammatically one embodiment of my improved system, and Fig. 2 is a top plan view in diagram of a form of induction-coil used in said system in practice.

I have in the present instance illustrated a metallic telephonic main-line circuit extending between stations *A* and *B* and having an intermediate station *C*. This station *C* divides the line into sections *L* and L^2, which, as is commonly the case in practice, are unbalanced, the impedance of the section *L* being considered the lower. At the station *C* is a current-reinforcing message-repeating or relay apparatus *R*, having its receiving element *r* situated in a bridge connection L^3, extending between opposite sides of the main line. The transmitting element r^2 of said apparatus is included in a local circuti L^4, containing the primary winding *p* of a transmitting induction-coil *P* and a battery or like source of electrical energy *V*. The secondary winding of the coil *P* is electrically divided into four sections *s*, s^2, s^3, and s^4, these sections being connected in pairs upon opposite sides of the bridge and in such a manner that they do not themselves disturb the balance of the line and so that the currents

induced in them will not oppose one another in the main circuit or circuits. This organization is similar to that described in the previously mentioned patent. The repeating induction-coil there illustrated has, however, been omitted, though it may be used, if desired, in connection with the present invention.

Included in each side of the main-line circuit is an adjustable resistance, this being preferably in four sections w, w^2, w^3, and w^4, situated between the secondary windings s, s^2, s^3, and s^4, respectively, of the induction-coil P and the complementary end of the bridge connection. Each of these resistances preferably

Though the induction-coil P for the sake of clearness is shown diagrammatically in Fig. 1 as being in two independent portions, it will be evident that the windings may be about a single core *14*, as has been illustrated in Fig. 2, these windings leading to terminals *15*, to which the circuits are connected. An arrangement of this sort is the one usual in practice.

In connection with the repeater circuits shown in the January issue and in this number it may be well to point out that the receiving element of the repeater is a

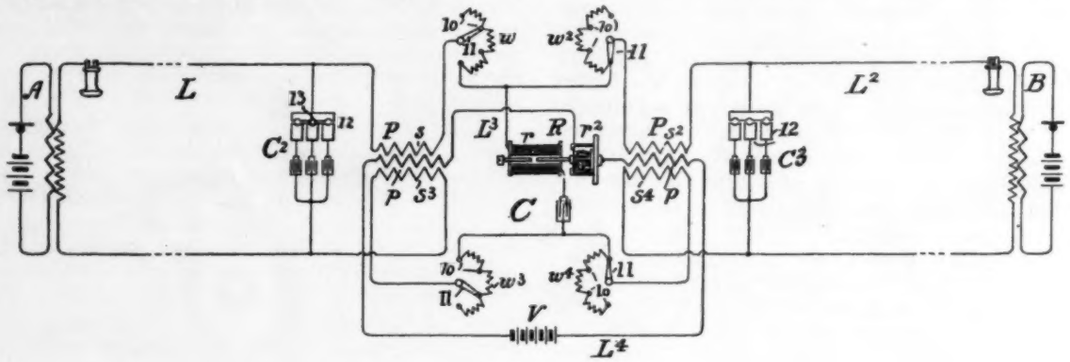


Fig. 1.

includes separated coils connected to contacts *10*, over which is movable a lever *11*, thus enabling a greater or less amount of resistance to be inserted in the line.

Bridged between the conductors of the main circuits or circuit-sections L and L^3 are condensers C^2 and C^3, respectively, of variable capacity, each in parallel or shunt relation to the two sections of the associated induction-coil secondary winding, each condenser being arranged in sections connected to circuit-changing plates *12*, which may be joined by plugs *13* to alter the capacity. These condensers may be effectively placed at the opposite sides of the associated pairs of secondary windings from the relay. As shown, these condensers are bridged across the main circuit or circuit-sections independently of both the relay apparatus at station C and the telephone apparatus at stations A and B.

In balancing the lines or line-sections similar electrical conditions are attained by varying, through either addition or subtraction, the resistance and capacity of either or both of said lines or line-sections until the most effective transmission in both directions is attained. To secure this result in the particular system illustrated, a suitable amount of resistance is thrown in by moving the levers of the resistances w, w^3 and capacity introduced by the application of one or more plugs to

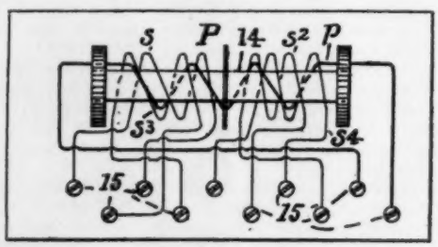


Fig. 2.

the circuit-changer controlling the condenser C. This latter operation also permits the equalizing of the phase in the sections. If necessary, these adjustments may be readily altered to meet varying electrical properties or conditions of the line. It should be noticed that the placing of the resistances and condensers at the points shown allows the balance of all portions of the main-line circuit with which is associated a reinforcing system of the character described without the introduction of disturbing conditions by these agencies.

While this invention has been described in connection with a continuous circuit having sections, it will be obvious that it is equally applicable to independent circuits organized and adapted to repeat into one another reciprocally.

The relay apparatus operates in a manner well known and need not be particularly referred to.

polarized device. This feature of the repeater is very important and may be briefly described in the inventor's words as follows:

"The magnetic system of the receiving agency when constructed as shown and described constitutes, it will be seen, an approximately complete magnetic circuit having fixed and movable or vibratory pole pieces at the center of the exciting and varying coils, and thus at the point of highest magnetizing power and at the most effective part of the magnetization varying field and whose only substantial gap in the continuity of its iron is that which is formed by the space between said poles."

Reference to the figures of the article in the January issue will clearly show these claims of the inventor. Further reference to the circuit Figure 1 will show that the receiving element of the repeater is located in a connection bridged across the line between transmitting stations. It is necessary in a repeating induction coil system to have equal efficiency in the renewal of the current transmitted in opposite directions over the line. It is also important in using the Shreeve repeater that the induction coil of the system is associated with the transmitting circuit and bridge connection so that the receiving element responds freely to the telephone currents impressed upon it by the transmitting circuit. When the latter is properly balanced as to its electrical constants upon the opposite sides of the bridge connection it will be noted from the circuit that the receiving element is neutral with respect to the reenforcing currents which the transmitting element throws upon the line. Particular attention is called to this feature of the Shreeve repeater, as it is a defect for good transmission. Since the receiving element is a polarized device, as formerly described, it will be clear that to insure equally effective operation under the influence of currents generated upon both sides of its bridge a definite relation must be established between the polarity of the receiver and the direction of the operating current. Unless this was accomplished conditions would be created where the reenforcing current would oppose rather than assist the operating circuit. It will also be apparent that unless the electrical balance upon opposite sides of the bridge connection are maintained a neutral condition will not be preserved, the relay

circuit will become unbalanced and the repeater will sing or howl. In other words, provided the repeater was connected to short lines, it would be very difficult to prevent the repeater from singing.

As pointed out in the January issue, Mr. Shreeve has found it necessary to provide in this invention an adjustable or variable resistance as well as capacity. The variable resistances are lettered W and W^2 and the variable capacities as C^2 and C^3, as shown in Fig. 1.

Attention is called to these inherent faults in the repeater and its circuit because they illustrate in a clear and simple manner how easily a repeater may injure good transmission as compared to the very minor inherent defects of a loading coil that is designed to contain a slotted or non-magnetic core.

It will be shown as we progress that the inventor himself recognized these important weak features of his device and continuously endeavored by a series of inventions of a later date to patent means for overcoming them.

Since the Shreeve repeater is designed on a transmitter and receiver basis, any mechanical defects it may possess are not as readily discovered as its electrical ones. In other words, he has drawn upon a known field in this respect and is more sure of his ground. This fact is of interest, as it will be illustrated that other repeaters assigned also to the A. T. & T. Co. contain a reverse condition, being so elaborate from a mechanical standpoint as to require pages of description in order to obtain a comprehensible idea of even their minor features.

In describing the mechanical features of his repeater, Mr. Shreeve points out in his description of it as contained in the January issue that the transmitting element has decided heat generating properties. As a matter of fact, he admits that unless some means is provided for overcoming this heating of the transmitter the carbon granules contained therein will be destroyed as far as their microphonic properties are concerned. He attempted therefore in the original design to overcome this vital and injurious condition by enclosing the transmitting element in a metal casing. This casing was associated with other metal parts and it was thought that a prompt and continuous removal and dissipation of the excess heat would be obtained. It will be noted in our further review of his more recent patents that it was finally necessary to make this element easily removable so that it could be replaced as desired in unit form. In other words, the method of radiation has not been successful and the frying of the granules so decreased the efficiency of the repeater as to require its constant apprehension and instant removal and consequent replacement at frequent intervals.

(To be continued.)

A. T. & T. for Eleven Months

The 11 months' statement of earnings of the American Bell Telephone operating system indicates that for the full year gross earnings will total approximately $295,000,000, an increase of about $29,000,000, or 12 per cent. As an offset to this, however, the expenses for the 11 months ended with November increased approximately $27,400,000, or 17 per cent. The final result of the surplus available for dividends was a decrease of $3,811,000, or 19.4 per cent. It is safe to assume that the operations for the full year will bear about the same relations.

The interesting feature of this situation is that the 1917 year was the first one since 1909 that the system showed a decrease in the net earnings, for this business was unique in showing a constant increase through good and unfavorable years in the general business conditions.

This falling off in net earnings is insignificant in itself, as the surplus after dividends was an ample one amounting to nearly 40 per cent of the total paid in dividends, which is a good margin against requirements. It is noticeable chiefly because of the rarity.

When it is considered that the resources of the entire system have been at the call of the government, and that a large number of the employes have been appropriated for government service both in this country and in France, the small decrease in surplus is commendable. As in the case of all other corporations, the telephone company has had to pay higher prices for all materials needed in the business, and the price of the service has remained practically unchanged.

An element in the decrease in surplus was an increase of about $3,800,000 in fixed charges and there was $1,394,000 more paid in dividends. These increases were due to new financing, a large part of which was for government work. The returns from these investments in the plants have not yet come in, so that gross earnings were probably not as large as they would have been if the proceeds from new securities had been invested in work for commercial and not war needs.

Bell Would Install Automatic

Officials of the Southwestern Bell Telephone Company announced that they have decided not to attempt to bring the present strike at Henryetta, Okla., to a settlement, but instead will install an automatic exchange. Engineers are to lay out the plans for the new board at once.

In placing the automatic board in service the officials declare that they are making a heavy investment, but that the present loss incurred through keeping the striking operators would soon pay for it. The company is now paying all operators full time, besides paying all hotel and other expenses. This, it is said, has already cost the company in the neighborhood of $21,000 above expenses which would have been paid had the strike not occurred. One hotel bill for the operators is estimated at $60 a day.

Just when the new board will be installed is not known, as it has only been intimated that it will be placed in operation soon. The board would have fully double the present capacity, which would probably supply the demand for telephones which has been increasing.

R. B. Keeting, federal mediator, who has been for several days attempting to mediate the differences between the strikers and the company, has returned to Washington, and stated before leaving that he would not attempt to deal further with the situation. According to his statement, the strikers' demands, if they be enforced, could not be mediated, therefore he gave it up as a bad proposition trying to obtain a settlement.

Delay Chicago Revision

Revision of telephone rates in Chicago probably will be postponed for one year. The rates which exist under the contract ordinance of 1907 between the city and the Chicago Telephone Company expire this spring, and under the provisions of this ordinance there must be a revision of rates every five years. The necessity of expending $36,000 for a survey of the telephone company's plant and equipment on which new rates would be established has caused the council finance committee to decide to ask the telephone company for an extension of the present rates for one year. This is in line with the retrenchment policy of the city.

Wireless in Forestry Service

A wireless system has been successfully installed at Baseline Ranger Station by forest officers. This station is some 38 miles north of Clifton, Ariz., and in the bottom of a deep canyon.

The system was installed by Forest Ranger Warner in November, 1916, assisted by Ray Potter of Clifton, who has a small wireless station of his own just north of Clifton. Ranger Warner, however, has had no previous experience whatsoever with wireless.

The serial wire is stretched across the canyon of Blue river, on which the Baseline ranger station is located, with the antennae some 148 feet above the level of the river. The supply of No. 10 iron wire that was being used ran out and ordinary barbed fence wire was used to complete the aerial line, from cliff to cliff. Copper and iron wire were used for the "lead in," from the antennae to the station.

On the night of November 29, the system was tried out, the first message being sent to Clifton, 38 miles away, to another wireless station, and was transmitted by them to the Western Union who transmitted it to Washington, Portland, Ogden, Denver, San Francisco and Missoula.

The unusual thing about this experiment is that Ranger Warner went at the matter an entirely green hand, and used whatever material he had at hand, barbed wire, etc., ordering the main apparatus from a mail order house.

Since the original installation a few of the parts have been replaced with more powerful ones in order to enable the ranger to receive messages better, and he has been picking up messages from the government wireless station near Washington, from the Pacific Coast, and even from vessels out at sea. He has also used the system in sending messages to Clifton several times, these messages being forwarded by telegraph to Springerville and to Silver City, regarding official business.

Forest officers are very enthusiastic over the possibilities of wireless in handling urgent business, such as reporting fires from locations now not reached by telephone lines. If a ranger can rig up a system out of barbed wire, and other odds and ends, at a total cost of not over $150.00, and with no previous experience in wireless, it would seem, they say, that some inexpensive and serviceable system could be readily devised whereby the cost of very expensive pole telephone lines could be obviated. Such cases are a wireless across the Grand Canyon, to render communication possible between the forest rangers on the south side and the north side of the Canyon, which during the dangerous fire season would be extremely advantageous, since the north side of the Canyon is much higher than the south side and overlooks a great part of the latter. Another local possibility is the installation of a wireless system from the top of the San Francisco Peaks at Flagstaff or Williams, or Jerome, whereby fires detected from the Peaks could be immediately reported to forest officers on the Coconino, Tusayan, Prescott or Sitgreaves forests—which can not be accomplished now, except by the construction of an expensive telephone line.

Forest officers are now at work on a modification of Ranger Warner's system whereby the system can be worked over into wireless telephony system, which is well recognized, has great advantages over the wireless telegraph, since no knowledge of code signals would be necessary. They are very hopeful that such a system can be worked out whereby an inexpensive and satisfactory means of communication can be gotten for localities where the construction of a pole telephone line would be out of the question.

A Real Pioneer

On the 10th day of April, 1881, says Jacob S. Hoffman, Reading, foreman for the Consolidated Telephone Company of Pennsylvania, in the company's paper, *The Mouthpiece*, I entered the employ of the Eastern Pennsylvania Telephone Company with offices at Reading. This company at that time operated in the counties of Berks, Lebanon and Schuylkill. It is quite some time since, but I well remember the first hole I dug along the Reading and Harrisburg pike, and if at any time I pass that way I certainly will take off my hat.

Line building work at that time was done quite differently as compared with this day. The holes were dug along the contemplated line for a distance of five and one-half miles, then the poles were distributed and subsequently erected. The line in question was a trunk between Reading and Lebanon, well built and also served the towns and smaller villages along the pike. After a time the poles were securely set and the wire was strung, but it appears to me now that we were exceedingly dense, not realizing that we could run more than one wire, which we did then.

Let me illustrate: One wire was started in Reading to Lebanon and the other wire from Lebanon to Reading, and when the work was done we patted ourselves on our backs and looked big. We do things differently now. Later on the company was absorbed by the Pennsylvania Telephone Company with headquarters at Harrisburg. I continued with the company until December 1, 1899.

In December, 1899, I entered the employ of the then Lehigh Telephone and Telegraph Company office at Allentown. F. A. Demarest was selected as superintendent and with him I immediately got busy. As it was a work of great magniture we put our heads together and devised plans how to go about the matter. In the first place every street and highway leading to Allentown had to be gone over carefully as to proper selection of location, number of poles and cables, and at the same time we were confronted by that very knotty question, "right-of-way." All this and much more had to be done before we saw our way clear and the work started in dead earnest. Then in due time pole lines were built from Allentown to Slatington, Saegersville, Germansville, Pleasant Corner, New Tripoli, Macungie, Emaus, Wescoesville and East Texas, and the Lehigh Telephone Company became a household word throughout the entire county. We also ran cable and lines to Catasauqua, Hokendauqua and the cement towns of Siegfried and Cementon in Northampton county.

Some time in May, 1901, J. F. Morgan, now district manager at Reading, and your humble servant were sent to Reading to prepare plans for a new telephone plant, Mr. Morgan having charge of the underground layout and myself of all overhead work. This was quite some job. Reading, as you know, is a city of about 105,000 population, and there were a large number of streets and other territory to be gone over before we could settle down to definite work.

As a passing incident let me tell you that I was almost too busy to sleep until the Reading proposition was a reality, but I never felt better in my life and would certainly not shirk a similar undertaking now.

Underground Telephone Cables

Abstract of An Article in the "Annales des Postes, Telegraphes et Telephones"

BY GEORGE VIARD

THE rapid development of telephony has led, more and more, to the utilization of underground cables instead of aerial lines. In many cases the latter method is obligatory owing to the large number of circuits. Extensions of aerial lines become more difficult every day; for the opportunities for conveying such lines along railways are continually becoming restricted owing to the fact that railways are themselves extending their installations.

It is therefore of interest to consider the technical conditions affecting the use of interurban underground telephone cables and the results that can be obtained from them from the commercial standpoint.

Ordinary telephone cables do not allow of transmission of messages to great distances. For long distance transmission one must have recourse to special improved types. Theory shows that increasing the self-induction of a line adds considerably to its power of transmission. In practice there are two possible methods of increasing this self-induction. The first method, known as "krarupization," from the name of the Danish engineer Krarup, responsible for this device, consists in increasing the permeability of the space adjacent to the conductors by surrounding the copper conductors with spirals of soft iron wire, 0.2-0.3 mm. in diameter.

The second process, which is designated also by the name of its inventor (Dr. Pupin), is termed "pupinization." It involves the insertion of additional self-induction, in the form of coils, at convenient intervals in the circuit.

Dr. Pupin has also investigated the relation between a conductor of this type and a truly homogeneous conductor having the same self-induction and resistance, but uniformly distributed. He states that a non-homogeneous conductor is equivalent to a truly homogeneous conductor in the proportion $\frac{1}{2}\varphi$ to $\sin \frac{1}{2}\varphi$. The angle φ is the angular distance between two successive self-inductions, an angular distance 2π corresponding to the length of the wave. Thus, if l is the distance between two successive coils, λ the wave-length, we have $\varphi/2\pi = l/\lambda$.

Pupinization enables a much greater self-induction to be added than does krarupization, and at a smaller expense. It is therefore in practice almost exclusively employed in the construction of interurban telephones of importance. Krarupization can only be effectively employed in very special cases. We shall, therefore, confine ourselves to the consideration of pupinized cables, and the results obtainable from them. The theoretical side of this question has been very fully discussed in all its aspects, and we propose to deal mainly with the practical side.

The first applications of pupinization date back to about 15 years ago. Since then we have passed through the experimental stage, and the process has become standardized. It may be remarked that standardization is particularly applicable to telephone work, as the same circumstances continually recur; naturally also standardization leads to economy.

The study of the pupinization of an underground circuit involves (1) the determination of the quantity of self-induction to be added per kilometer; (2) the specification of the inductive coils. When self-induction is added to a circuit the weakening effect first diminishes and then subsequently increases; there is therefore a minimum of weakening and a maximum value of the self-induction which it would be useless and even injurious to exceed. This value is often termed the maximum self-induction. For a circuit of given capacity maximum self-induction is proportional to the resistance per kilometer; it therefore varies considerably with the diameter of the cable. In practice the amount of self-induction actually added is always much below this maximum. We shall explain shortly why this is so.

As regards the distribution of self-induction, the rule of Pupin is not immediately applicable in the form enunciated above. From a practical standpoint what is needed is a rule that fixes at once the distance between successive coils.

If one is concerned with the transmission of currents of a single frequency, one can readily determine the distance between the coils by the ratio which is permissible between the pupinized line and the line as actually treated. For example, for a variation of 5 per cent we should have at once,

$\frac{1}{2}\varphi \sin \frac{1}{2}\varphi = 1.05$, whence $\frac{1}{2}\varphi = 0.53 + l\omega L/6$;

that is to say, it would be necessary to install six coils per wave-length.

But the problem is not simple because in practice telephone currents are not sinusoidal and of a definite frequency, but are complex currents containing many sinusoidal components; therefore the distribution appropriate for one of these frequencies would not be the best for others, because the wave-length depends on the frequency. Some currents would therefore be weakened in a greater proportion than others, and the summation of the currents, *i. e.*, the conversation current, would therefore be subject to distortion. This distortion is in general greater according as the distance between the coils in increased. If the distortion is not great the ear can interpret the sounds transmitted, but if it passes a certain limit the sound is no longer recognizable. Prof. J. A. Fleming has likened this effect to a caricature. If, in a caricature, the individual traits are not unduly exaggerated, one is still able to recognize the original. But if the process is carried too far one can no longer identify the subject of the caricature, and it becomes unrecognizable.

However, the difference between the pupinized line and the line with uniformly distributed resistance and self-induction is not the only cause of distortion. The variation in the "admittance" (the reciprocal of the insulation and is expressed in mhos) and in the resistance of the coils according to the frequency are the chief factors. For cables insulated with gutta-percha or paper the effective admittance is proportional to the frequency. The effective resistance of the inductive coils is likewise affected by the frequency owing to the losses in the iron through hysteresis and eddy-currents. Good transmission of words is, therefore, not achieved by the strict application of Pupin's law. A modification is necessary in order to take account of all the causes of distortion.

The wave-length, for a highly inductive line, is given by the formula: $\gamma = 2\pi/\omega\sqrt{CL}$, where C and L denote respectively the capacity and self-induction per kilometer and ω the frequency of the current considered. Pupin's law, stating that there a certain number of coils per wave-

length, can always be finally put in the form: $CL_1l<A$, A being the factor which, as we shall see, must be determined by experience, l the distance between two coils, C the capacity per kilometer of the circuit and L_1 must be inserted because one assumes that the self-induction is due exclusively to the added coils.

In Great Britain this rule is adopted in the form: $CL_1l<25$, C being the capacity per mile expressed in microfarads, l the distance between two coils, expressed in miles, L_1 the self-induction total per coil, expressed in millihenries.

There is no change necessary in the formula if one substitutes kilometers for miles.

In America the rule has been stated in another form, namely: The front of a wave which progresses along the line must encounter at least 7,000 coils per second.

In Germany it is customery to derive another quantity, namely, the frequency of the free oscillations in an element of pupinized line. Each coil forms, together with the half-sections of the line on either side of it, an oscillating circuit, the inductance of which is L_1, and the capacity $\frac{1}{4}Cl$, taking account of the fact that the capacities of the two sections are situated in series. The frequency of the free oscillations in such a circuit is given by the formula: $\omega_0\sqrt{(L_1\frac{1}{4}Cl)}=1$. The pulsation ω_0 should be as different as possible from that of the currents to be transmitted. It is specified that ω_0 should have a value at least equal to 16,000.

The following table illustrates the very considerable differences in the rules followed in various countries:

Country—	*Maximum Values of Product,* CL_1l.	*Minimum No. of Coils Encountered by the Front of a Wave in 1 Sec.*	*Frequency of Free Oscillations in an Element of Line.*	*Relative Number of Coils Used.*
England.....	25·0	6,325	12,650	79·0
America.....	20·4	7,000	14,000	87·5
Germany.....	15·6	8,000	16,000	100·0

In France, in the first experiments, it was proposed that the main frequency should be above 16,000. Subsequently, it has been asked whether it would not be an economy and a simplification to follow the rule applied in Britain. From tests undertaken by the post office, it has been decided that the clearness of transmission was sufficient, and it has been decided, in future construction, to follow the rule.

The differences in the mode of distributing coils in different countries cannot be explained entirely by variation in quality of material employed or difference in language; they may be due to the lengths to which the effort to secure perfect clearness has been carried. It seems reasonable not to press this point too far, for the telephone is mainly intended for commercial use; that is to say, sufficient audibility and correct comprehension of spoken words are more important than the perfect and almost artistic reproduction of the timber of a voice. Such refinements add to the first cost of installation as well as making extensions more expensive.

Experience has shown that a series of coils having the inductances indicated in the above table are well adapted to normal practice. It is only in the case of very important connections that it will be found necessary to depart from these types of standard coils.

It is next of interest to refer to the specification of coils, *i. e.*, the choice of quality of inductance. Inductance can never be added without at the same time increasing the resistance. It is usual to judge coils from this standpoint in terms of the factor R/L, the quantities being measured at a frequency of 800. This factor is the reciprocal of the time-constant of the coils, and represents the additional resistance introduced per henry of inductance. The diminution of this factor involves an increase in the amount of iron and copper used in the coil, and consequently in the bulk and cost of the latter. It is, therefore, necessary to make a compromise. For a diameter of 3 mm. we may have $R/L=50$, for higher diameters 35, and even, in exceptional cases, 25 or 20. The variation in effective resistance with frequency must also be limited as far as possible.

Nature of Pupinization.	*Inductance of Coils in Henrys.*	*Distance Between Coils in Km.*	*Inductance Added per Km.*	*Values of* CL_1l.	*Characteristic.*
Very weak..	0·060	9·0	0·007	21·6	410
Weak.....	0·135	4·0	0·034	21·6	920
Average.....	0·175	3·0	0·058	21·0	1,200
Strong.....	0·250	2·15	0·116	21·5	1,700

N. B.—This table relates to the pupinization of a cable having a capacity per kilometer of 0.04 mf.
The numbers indicated in the column under the heading "Characteristic are values of $\sqrt{L/C}$.

Other qualities which are desirable in coils are: (1) High insulation; (2) low mutual induction between adjacent coils; (3) small bulk; (4) feeble magnetic remanence. All these points deserve attention, conjointly with the matter of cost.

Returning to the table it may be remarked that each type of coil corresponds with a certain distance, and therefore a certain additional inductance per kilometer. The characteristic is the measure of the factor $\sqrt{L/C}$. This quantity determines the nature of the pupinization, since, for a given power of transmission, it decides the necessary voltage. The stronger the pupinization the higher the voltage which must be applied to the line. While it is not difficult to ensure adequate absence of induction between neighboring circuits in the case of ordinary telephone circuits, this is no longer the case for pupinized cables. On these cables one has always strong mutual induction if special measures are not taken to secure equilibrium of the capacities of the circuits.

Moreover, insulation defects become more marked as the voltage increases; consequently if there is not uniform admittance on each of the cables, we again get disturbance of equilbrium, which reveals itself as inductive effects. Finally it may be added that if the efficiency of the circuits is increased, all disturbances of E. M. F. produce a more marked effect than in ordinary cables. In practice, therefore, if one wishes to obtain exemption from interference with other circuits it is best not to pupinize too strongly.

There are other reasons for advocating relatively weak pupinization. For example, in this case the distortion due to the coils is reduced to a minimum, and the characteristic is of the same order as that met with on aerial lines.

In determining the conditions of pupinization one may either use wires of small diameter, strongly pupinized, or conductors of larger diameter, relatively weakly pupinized,that is to say, we may dispense with coils to some extent by using more copper and vice versa. In England and France it is usual to employ weak pupinization for average distances. In America and Germany stronger pupinization will be found. However, each circuit requires to be separately considered, and conditions which answer well in one case are not necessarily the best in another. The study of these conditions is essentially a matter for the specialist.

Finally, it is easy to demonstrate the general advantages, from the point of view of communication, of underground cables. Such cables are protected against

weather, not only falls of snow, gales of wind, but the smaller irregularities caused by constant exposure to rain, which frequently derange aerial lines. The underground cable, protected by its conduit, is secure against mechanical rupture, whereas overhead lines are often frayed or broken. The telephone is an exceedingly sensitive instrument. The slightest irregularity of insulation, permitting contact with telegraphic or industrial currents, will affect the transmission of sound; the same applies to thunderstorms which, in the case of aerial lines, may compel complete cessation of traffic. The underground cable is subject to none of these troubles, and one can always rely on an established connection. The absence of parasitic noises is so complete that it enables conversations to be carried on with much lower intensity of sound than when aerial wires are used.

It is true that the cost of installation of an underground cable is much above that of an aerial line. This circumstance is aggravated by the fact that a reserve of circuits must be provided which, during certain intervals of time, may be little used. But this higher first cost is largely compensated by the almost total absence of maintenance expenses, and the freedom from accidents.

Tree Trimming Decision

Judge Doyle has just made a decision in the case of the Chatham Farmers' Mutual Telephone Company vs. Samuel Brant for injunction and equitable relief. This is the second oldest case on the Medina county, Ohio, docket, being commenced September 28, 1914. The telephone company complained that Brant had torn down two of its wires and threatened to cut down its poles and destroy other property. In his answer the defendant stated that when the company originally strung its wires it damaged some fine shade trees on his property and that when he cut the wires the company was engaged in stringing more wires and doing more damage. In a cross petition he asked an injunction against the telephone company. Temporary injunction was allowed but the case did not come up for hearing until last October when it was heard by Judge Doyle who has only now rendered his decision, making the injunction perpetual against the defendants and dismissing the answer and cross-petition. It is understood the case will be carried to the court of appeals.

Poles in Highway

The right of a telephone and telegraph company under its franchise to maintain poles in a highway is qualified by the paramount right of the county authorities to keep the highway in reasonable condition for ordinary use by the public, and the damage which necessarily follows to such licensee from an improvement of the highway without negligence by the county authorities would not be a taking or damaging of property within the meaning of the law which provides that no private property shall be taken or damaged for public or private use without just compensation having been made, it was held by the Supreme Court of Washington (165 P. 102). It follows that if the county is not liable, the contractor, who was the agent of the county in doing the work, and had agreed to do the work in accordance with the plans and specifications of its contract with the county, and under the direction and superintendence of the county engineer, would not be liable, in the absence of negligence on its part being shown.

J. J. Hill on Thrift

Thrift is not a virtue of tomorrow, but of today. The young man who puts off until he is earning a larger income or has satisfied some present want, or for any other reason, the effort to spare and accumulate, is pretty sure never to begin unless under the pressure of misfortune. And it is really true that only the beginning is difficult. The first $50 or $100 are slow to gather, and look unimportant even after they have been saved. But there is magic in the fact. The income from investment, however trifling, confers a sense of power, and carries a promise that allures. More important than all, a habit of saving has begun to push a sprout through the crust of indifference and self-indulgence. Independence in character asserts itself. Purpose strengthens. Possibilities appear. Thrift is a rare discipline in self-control. Presently there are a new man and a new force in the world.

Japanese Telephone Numbers

The luckiest telephone number, in the estimation of Japanese business men, is 8, because the character for it spreads downward and suggests the idea of gathering prosperity. No. 753 is also a lucky number because children are presented at Shinto shrines on their third, fifth and seventh birthday, says *Bell Telephone News*.

Three figure numbers are not objectionable, if they are easy to remember, like 123 or 555. The most unlucky numbers are 42 and 49, because the former may be pronounced "shini," which means "to die," and the latter may be pronounced "shiku," which means "death" and "suffering."

Therefore, these numbers are generally taken by government officers, schools, police stations and other institutions which are presumably immune from dangers such as might befall the individual should he fail to heed the demands of superstition.

Mildly Interesting if True

The rule is strict against using profane language when talking over the telephone. A telephone experiment has proved a failure in Lynn, Mass., according to the report of an eastern newspaper. The manager, it says, noticed that "wrong number" calls were frequent, and he ordered the "hello" girls to call each digit separately and to insert the word "dash" after each one. The method was slow, but the climax was reached when a Lynn man was in a hurry to get a Boston newspaper office. He called for "Boston 3000" and heard a sweet voice at "central" say: "Beach three, dash, oh, dash, oh, dash, oh, dash."

That nettled the Lynn man and he called out:

"Well, what are you cussing about?"

The order was abolished, and no more dashes are being said by the telephone girls at Lynn.

More Small Town Stuff

Parkersburg, W. Va., telephone operators are complaining of being annoyed by idle jokers, who recently seem to have banded together for the purpose of calling on the telephone and asking such questions as "What time does the Ohio river pass Parkersburg?" The time of the operators is thus taken up and it delays service for those who use the telephone for legitimate purposes.

World Telephone Development

In the absence of many official returns, it is not possible to give a precise statement of the world's telephone development since 1914. One may, however, form a rough estimate, says W. H. Gunston, in the *Telegraph and Telephone Journal.* America is among those countries whose figures are not founded on conjecture, so also is Canada, and these exceptions are important, seeing that North America contains nearly three-fourths of the telephones in the world. Official figures up to varying dates have been obtained from New Zealand, South Africa, Russia, Sweden, Norway, Denmark and Switzerland, while newspaper reports have furnished recent data relative to Japan, Brazil and other places.

Europe, which had 3,910,000 telephones at the beginning of 1914, had at the beginning of the current year probably 4,180,000, made up as follows:

Country—	*Total Stations.*
Great Britain (including emergency stations)	812,000
Russia (January 1, 1916)	400,000
Sweden (271,797 at January 1, 1916)	say 288,000
Denmark (150,000 at January 1, 1916)	say 165,000
Norway (94,000 in January, 1915)	say 100,000
Netherlands (78,743 at January 1, 1914)	100,000
Switzerland (January 1, 1917)	104,000
Spain (36,660 at January 1, 1915)	say 50,000
Austria (170,000 at January 1, 1915)	170,000
Germany (pre-war)	1,421,000
France (pre-war)	310,000
Italy (pre-war)	95,000
Belgium (pre-war)	51,000
Hungary, the Balkans, Portugal, Luxemburg, etc. (pre-war)	114,000
	4,180,000

Nothing has been added in this estimate to the pre-war figures for France, Germany and Italy, to the 1915 figures for Austria, or to the 1916 figures for Russia, in view of the complete lack of information regarding the development of the telephone in those countries in recent years and the small probability of any considerable expansion. The telephone system of the Netherlands had been increasing up to 1914 by 7,000 to 8,000 a year, and there is no reason to suppose that this increase has not been maintained. Belgium's total has undoubtedly decreased, but against this may be set the probability of some increase in Portugal, Roumania and Greece. It is satisfactory to note that Great Britain has increased from the pre-war figure of 774,000. Even if the "emergency stations" be eliminated a small increase is still shown. London, despite statements in the press to the contrary, has increased from 259,000 to 269,538. Again, even if the emergency stations were disregarded, the movement would be seen to be in the right direction.

ASIA.

Asia had 303,000 telephones at the beginning of 1914. Since then there has been an increase of 20,000 in Japan, 6,000 in Siberia, and about 2,000 in Corea, Manchuria and Formosa. Making allowance, therefore, for the normal expansion in the Dutch East Indies (6,000), and some development in China and British India, we may safely put the total for Asia at 340,000.

AFRICA.

There were 59,500 telephones in Africa in 1914. The figures for South Africa had increased by 4,000 by the beginning of 1916. Allowing for some increase in Egypt, Algiers and Tunis, I should compute that there were at least 66,000 stations in Africa at the beginning of this year.

NORTH AMERICA.

Recent information shows that there are 11,300,000 telephones in the United States. Canada had 533,090 at June, 1915. At the normal rate of increase there would be 550,000 by January last. The unknown quantities are Mexico and the West Indies, which had 70,000 stations amongst them before the war. The total for North America is thus at least 11,920,000.

SOUTH AMERICA.

Of South America no information is available, except of considerable development in Brazil. There were about 170,000 telephones in this continent in 1914, and as the Argentine and Brazil progress at the rate of some 10,000 or 12,000 a year, there cannot be less than 230,000 stations working at present.

AUSTRALASIA.

Official figures show that there were 168,416 telephones in Australasia on June 30, 1916. New Zealand had 58,796 and Hawaii 7,000. Total 234,000. To resume:

Europe	4,180,000
Asia	340,000
Africa	66,000
North America	11,920,000
South America	230,000
Australasia	234,000
Total	16,970,000

In January, 1913, there were about 13,500,000, and in 1914 14,500,000, telephones in the world. It will be seen that at January, 1917, there must have been close upon 17,000,000.

Are You On Time?

Caesar's delay in reading a message cost him his life when he reached the senate house.

Alexander the Great was asked how he conquered the world. He answered quickly, "By being on time and not delaying."

Franklin said to a servant who was always late, but always ready with an excuse: "I have generally found that the man who was good at an excuse is good for nothing else."

Grouchy failed to be on the job, the imperial guard was licked, Waterloo was lost. Napoleon was yanked off a prisoner to the rock at an early age—all because one of his generals was behind time.

The grand old man of Regent Street, William Ewart Gladstone, was an early riser. One of our greatest retailers has this for one of his favorite sayings.: "The better the tardy man's excuse, the worse the reason."

Peter the Great always rose as the little stars were fading from the sky; so did Alfred the Great. In the small hours of the morning Columbus planned his voyage of discovery. Napoleon planned his great campaign in the early morning hours. Copernicus was an early riser. Bryant rose at five, Bancroft at dawn.—John Miles, in *System.*

Wrong Again

Sergeant, drilling awkward squad—"Company, attention! Company, lift up your left leg and hold it straight out in front of you."

One of the squad held up his right leg by mistake. This brought his right-hand companion's leg and his own right leg close together. The officer, seeing this, exclaimed angrily:

"And who's that blooming galoot over there holding up both legs?"—*Monad.*

Introduction of the Composite System

Paper Presented Before the Telephone Pioneers of America

BY F. A. PICKERNELL AND T. D. LOCKWOOD

IN the winter of 1890 D. H. Bates submitted to E. J. Hall, vice-president of the American Telephone and Telegraph Company, the Van Rysselberghe system of simultaneous telephony and telegraphy. This system had previously been operated experimentally by the B. & O. Telegraph Company on various lines and on the heavy copper circuits of the Postal Telegraph Company between New York and Chicago. Mr. Bates offered one set of apparatus for experimental use.

Mr. Hall appointed a committee, consisting of T. D. Lockwood of the American Bell Telephone Company, G. A. Hamilton of the Western Electric Company and F. A. Pickernell of the American Telephone and Telegraph Company, to investigate the mechanical and electrical feaures of the apparatus.

The committee met and the apparatus was submitted by A. E. Leslie, representing Mr. Bates. This apparatus was enclosed in two boxes and contained the usual condensers of about 2 mfds. each and retardation coils of about 500 ohms each. The equipment was such as would equip one metallic circuit, and, by its means, a metallic circuit between New York and Boston, for example, would provide one talking circuit and two Morse lines. Up to this time the leased wires of the American Telephone and Telegraph Company had made use of single wires and these wires were of no use for telephonic transmission.

The committee set the apparatus up in the office of F. A. Pickernell and put it in operation. Barring slight disturbance to the telephone, certain sluggishness in the telegraph circuit and interference with the telephone clearing out signals, the service was satisfactory and gave promise, in the opinion of all, of being capable of commercial development. The committee decided to turn the apparatus over to F. A. Pickernell for demonstration under commercial conditions.

Mr. Pickernell took over the apparatus and immediately made arrangements to install it between New York and Boston. For the period from March 14 to April 28, 1890, service was given by means of this Van Rysselberghe apparatus to several regular leased wire subscibers, and the usual telephone subscribers between New York and Boston.

The results were satisfactory and gave promise of great development. The only serious difficulty was that the clearing out drops on the telephone circuit were inoperative and operators had to supervise the connection by "listening in."

After April, 1890, investigation into the patent side of the situation revealed that the Belgian inventor, Von Rysselberghe, had taken out patents in almost every country in Europe before he had in the United States; and among others he took out patents in Denmark. But the patent law of Denmark at that time was peculiar, and provided that, while a Danish inventor might have a patent for the first period of five years, and then five years more, no person other than a subject of the King of Denmark could have a patent for more than five years, or a first period; but the United States law at that time provided that, if any patent was taken out in the United States which had previously been patented in any foreign country, the United States patent was limited to expire with the earliest expiring foreign patent. So, when this matter of the Danish patent was investigated there seemed to be "something rotten in the State of Denmark," as Hamlet would say; and Mr. Lockwood reported the matter to J. E. Hudson, then president and gave it as his opinion that the company need not dicker with these people that were offering the patents for sale at all, but go ahead and use the invention any time it liked. They asked two million dollars for it. Mr. Hudson was not content with a mere layman's opinion in patent law, and he had to get the opinions of a great number of patent lawyers.

The matter hung fire until April, 1891, when E. J. Hall instructed Mr. Pickernell to call on Chauncey Smith, general counsel of the American Bell Telephone Company in Boston, and explain to him exactly what circuits were to be used in operating the Van Rysselberghe system of simultaneous telephony and telegraphy. Mr. Pickernell started for Boston on the midnight train, but a wreck delayed the train, so that he did not reach Mr. Smith's office until noon the next day. Mr. Smith examined the drawings and discussed the problems involved, and finally stated that he understood the case thoroughly, and to say to Mr. Hall that the system described could be used, and that he would immediately so advise President Hudson of the American Bell Telephone Company. This was a very satisfactory interview to Mr. Pickernell, and, upon leaving the office, he called on A. J. Lewis, manager of the Boston office of the American Telephone and Telegraph Company. Mr. Lewis informed him that the main line between Boston and New York had been wrecked by a sleet storm the night before (April 3, 1891) and that it could not be repaired, in his opinion, in less than 30 days, and that he feared that the 20 leased wires, or most of them, would be lost before the service could be restored. At that time the American Telephone and Telegraph Company had two lines between New York and Boston, the main line carrying 40 through wires, and the shore line, newly constructed, 20 through wires. The shore line was intact. The outlook was discouraging, as the storm damage extended from Wayland, Mass., to Springfield, Mass., and the early damage reports had not been exaggerated. Mr. Pickernell went to the Adams House, and, after dinner, called up E. J. Hall at Morristown, N. J., and said to Mr. Hall that the next day being Saturday, he was of the opinion that the shore line could be Van Rysselberghed and the leased wire service of the American Telephone and Telegraph Company re-established by Monday morning. He repeated the verbal report of Chauncey Smith to the effect that the company was at liberty to use the system, and Mr. Hall was much interested. He said: "Mr. Pickernell, call at Mr. Hudson's office the first thing to-morrow morning, and get instructions." Mr. Pickernell called on Mr. Hudson on Saturday morning and told him the whole situation. Mr. Hudson called Chauncey Smith by telephone and when he had finished, he said: "Pickernell, I hope you can do it, and what can I do to help you?" The only thing he could do was to have the elevator run all night. Mr. Pickernell went to the office and got in touch with A. S.

Williams, his assistant in New York. One of the difficulties of the situation which now confronted him was due to the fact that nobody in the New York office was familiar with the Van Rysselberghe system, as all discussion had taken place in the committee. It was necessary to make a circuit drawing and transmit it to Mr. Williams by tetlephone. This was done and the apparatus arranged for.

The company made use of 600-ohm retardation coils used in the "busy test" circuit of the rebuilt Cortlandt street switchboard, which were in stock. This was before the days of the modern condenser, and the Western Electric Company was out of stock, condensers in those days being used mostly by the telegraph companies.

Mr. Pickernell immediately got in touch with Mr. Marshall, a condenser manufacturer in New York. Mr. Marshall had a large shipment of condensers he was making on a rush order for the Chicago office of the Western Union Telegraph Company, but he agreed to let them go for this emergency use. Accordingly, the apparatus was assembled, and the equipment for Boston left on the 3 o'clock train for Boston, G. L. Betts, chief clerk to Mr. Pickernell, taking it as extra baggage. That night and Sunday, the apparatus was installed at both ends and ready for operation Monday morning. One condenser was defective. But Monday morning 19 leased wires were started by the Van Rysselberghe system, between Boston and New York, and the situation was saved. Since that time the system, vastly improved, has been in continued use and has been of very great value to the company. As it became standardized, it became desirable to get a better name, and accordingly T. D. Lockwood was asked to name it. He selected what has seemed the appropriate name, "Composite," and in this way it has become the designation of an important branch of the Long Lines Department of the American Telephone and Telegraph Company.

A Lesson in a Picture

There lies on the editor's desk a magazine with a picture in it that ought to be seen by every farmer in America. There is shown a bleak countryside with two women plowing. One of the women is leading two lean horses, while the other is guiding an antiquated implement. Because all the able-bodied men are at war, these women of Galicia are tilling the fields. And they seem to be tilling them well. Their broad backs and weather-tanned faces show they are used to the rough outdoor toil. And yet, to us here in the central west, the picture somehow is not pleasant.

There was a time in the pioneer period of the United States when our great grandmothers did sometimes guide the plow. There even may be seen today a woman occasionally guiding the plow. But social standards have risen in the rural communities, and the self-respecting, up-to-date farmer will not permit his women folk to get into the fields and do rough work.

It is understood pretty generally nowadays that the women should be permitted to stay around the house and should be given every convenience and comfort that the market can provide. Thousands of labor-saving devices are being sold every year in our farming communities. America's farmers do not intend that their wives and daughters shall be subjected to the toil and the danger met with in the fields. And this is right. It means we are a civilized nation, for civilized nations respect their women.

There is a lesson in the picture. Galicia is a province of Austria. The women there work in the fields even in times of peace, because it is impossible for their husbands to make enough from their crops to pay the noble landlords their rent without the help of their families—wives and children. The farmers over there are so ground by taxes and exactions in rent that they are unable to provide their wives and children with many of the ordinary decencies of a home, much less any of the thousand and one comforts and conveniences of the American farmer's home.

The peasant farmer often can neither read nor write; his wife can neither read nor write. They are too busy in the fields working that the nobleman may receive their rents and live in luxurious laziness in Vienna or Budapest.

These same noblemen were instrumental in starting the European war. President Wilson a short time ago suggested that the United States include Austria among her enemies, and Congress declared war against that country. The United States is fighting Germany and Austria —or the ruling classes of those countries—"because they are a menace to civilization."

The picture in the magazine shows one way in which they are a menace to civilization—our civilization, at least.

Over there the women till the soil and feed the armies of the empire while the soldiers hurl explosives and goison gas at America's sons who have been sent abroad to see that central European standards of living are not introduced into America by some conquering kaiser—either a Wilhelm or a Carl. This form of so-called civilization must and can be defeated, and the American farmer can strike his blow against it by lending his money to the government for use in the war for real civilization.

Indiana Company Gives News Service

On February 1 the Greenfield, Ind., Telephone Company started what is called a farm line announcement service, which consists of announcing over each farm or rural line, the weather forecast or report, the hog and cattle market reports and the correct time of day.

The operation of this service is as follows:

The telephone operator, using but one line at a time gives ten or more short rings on the line, and to all subscribers on the line this is known to be a general ring for the purpose of calling everyone to their telephone. Upon receiving such a call everyone takes down his receiver and listens very eagerly for the daily markets or other current news, such as special sales of local merchants or prices which Jones, Smith or Brown may be paying for poultry and eggs, farmers' closing out sales, etc., etc.

The merchant who is conducting a special sale or who is opening up a new season's goods will find "Telephone Announcement Service" an effective way of calling the attention of all rural telephone users to what he has to offer.

The farmer who is planning a closing out sale will find that a "Telephone Announcement" will bring a large crowd to attend his sale. Every auctioneer will readily see the value of this service.

This form of advertising will help the local business which some glittering display advertisement is now pulling to the cities.

This service is new to that part of the country and there is no doubt but that the business men of Greenfield and vicinity will take advantage of this new and novel way of reaching the farmer and rural route trade.

Early Incidents

J. W. Thompson of San Francisco, Cal., in a talk before the Telephone Pioneers of America, tells of some funny incidents in installing the first telephone exchange in San Diego, Cal., in 1882.

"The first question was whether or not we should ask for a city franchise. My attorney thought inasmuch as it was a plaything, so to speak, we might as well go ahead without it; we had a right to use the streets and highways if we did not obstruct them. We thereby acquired an "easement," which could not be disturbed. We acted accordingly.

In installing the first telephone exchange in San Diego, Cal., in 1882, the first question was whether or not we should ask for a city franchise. My attorney thought inasmuch as it was a plaything, so to speak, we might as well go ahead without it; we had a right to use the streets and highways if we did not obstruct them. We thereby acquired an "easement," which could not be disturbed. We acted accordingly.

In construction we utilized housetops as much as possible. The length of spans was immaterial. In one instance we came to a two-story house of an ex-colonel of the Mexican army, who felt greatly honored that we should attach wires to his house. When accomplished, he ran up the American and Mexican flags. "Senors, I salute you."

Another housetop incident: A personal friend of mine got married and moved into a cottage where I had a wire on the building. It was a long span and the wire "hummed" terribly. He came to me one day and asked if the humming could be stopped, that his wife could not sleep and was becoming nervous over it. I remarked to him that the previous tenant never objected, so I thought it was all right, but it did not occur to him that the previous tenant was very deaf. However, he said they would try it a while longer. Subsequently we removed the wire.

Another incident, contrary to above, was a gentleman who hoped we would not remove the wires from his house as the humming was very soothing to his nerves.

Soon after opening my exchange, a lady friend came into the office. I asked if she would like to try the "fone." She said "yes." I switched her to my residence where my wife was at the other end of the wire. As soon as she heard my wife's voice she exclaimed in great astonishment: "Why, that's your wife," and dropped the receiver on the floor, breaking it.

Public Utilities in War

So long has it been customary for the American people to "cuss out" public utilities and the big corporations that we have hardly realized the heroic and splendidly patriotic part which these great orginizations all over the country have played, and are now playing, in this, the greatest crisis of our country's history. After being regulated almost out of business, and victimized by every new reformer who arose in the halls of our national legislature, we find the big corporations turning loyally and ungrudgingly to aid the government in its hour of need. The big railroads and other public utilities, including the vast telephone system which covers the country, have been virtually placed at the disposal of the government, all offering their services and their equipments to the end that the government may most quickly and most efficiently meet existing emergencies. We saw it stated recently that nearly fifty per cent of the volume of telephone business now transacted is purely government business, a sort of new creation which war has brought forth. All this must be taken care of in addition to the ordinary volume of business that previously existed. And yet there are men and women so inconsiderate that they wholly ignore these unusual conditions, and continually nag and scold if conditions on their telephone lines are not quite as satisfactory as they were before the great companies of the country took up the government's burden. It is this want of consideration, this total lack of appreciation of efforts that are really worth while, which handicaps further effort at betterment. People will not stop to reflect for a moment that such an emergency and unusual demands disturb the even tenor of business as they do the individual.

These remarks also apply to railroad conditions. The traveling public is prone to kick and howl because things are not as they were in railroad circles before the United States entered the war. They cannot understand how it is that the railroads—with no opportunities to increase their facilities and equipments when the sudden call came—cannot maintain their standards of a few months ago. Indeed, we hear the railroads criticized much more bitterly than ever before. And yet all the time, as is the case with all other public utilities, they are doing their part and doing it nobly.—Asheville, N. C. *Citizen.*

Government Census for 1914

Table 26 shows the statistics for telephone apparatus for 1914, 1909, and 1904:

	Telephone Apparatus		
Class.	1914	1909	1904
Total value	$22,815,640	$14,259,357	$15,863,698
Substation instruments:			
Central battery—			
Number	641,082		
Value	$ 3,916,869		
Magneto—			
Number	216,879		
Value	$ 1,799,834		
Interior systems:		$10,137,534	$13,227,008
Number	62,258		
Value	$ 510,509		
Central switchboards	$12,079,337		
Manual	$11,076,615		
Central battery	$10,701,764		
Magneto	$ 374,851		
Automatic	$ 1,002,722		
Private branch exchange switchboards:			
Number	3,693	2,252	3,917
Value	$ 448,203	$ 369,915	$ 564,795
Parts and supplies, value	$ 4,060,888	$ 3,751,908	$ 2,071,895

The aggregate value of all telephone apparatus, parts, and supplies produced in 1914 shows an increase of $8,556,283, or 60 per cent, over that reported for 1909. It is difficult to analyze this increase in telephone apparatus of various types, owing to changes in the schedule used to collect the data at the different censuses.

Substation instruments, interior systems, and central switchboards, as reported in 1914, showed an aggregate value of $18,306,549, as compared with $10,137,534 in 1909, an increase of 80 per cent. These were reported at the censuses of 1909 and 1904 under different headings. By far the greatest increase is in central switchboards. In 1909 central switchboards only were called for and reported, to the value of $2,398,909.

Under "substation instruments" in 1914 central battery and magneto instruments were reported to the value of $5,716,703. In 1909 separately reported transmitters and receivers reached a combined value of $2,511,691, in addition to which 732,697 "complete sets of instruments" were reported, valued at $5,103,849.

In 1909 interior systems without instruments were reported to the value of $123,085, as compared with $510,509 in 1914. Private branch exchange switchboards show an increase of 64 per cent in number and 21.2 per cent in value for 1914 as compared with 1909.

How Municipal Ownership Works

The last federal census gives a very exhaustive analysis of the electric business of the country, from which the following figures are taken:

	Privately Owned and Operated	*Municipally Owned and Operated*
Number of stations	3,659	1,562
Total income	$278,896,610	$23,218,989
Total expenses	217,502,313	16,917,165
Persons employed	71,395	7,940
Total horse power	6,969,320	559,328
Kilowatt capacity of dynamos	4,766,012	368,677
Kilowatt hour output	10,995,436,276	537,526,730

From these figures we get some interesting comparisons. The ratio of operating expenses to income was 78.0 per cent for private plants and 73.9 per cent for public plants, the difference being in the rents, taxes and insurance which the people pay in another way, but which does not appear in the accounts of the plants. This, however, does not result in any saving, as it was more than eaten up by inefficient management. The private plants got an income of only 2.5 cents per kilowatt hour as against 4.3 cents for the public plants. But the public plants reversed the figures on expenses, their cost being 2.9 cents as against 1.9 cent per kilowatt hour for the private plants. The higher efficiency of the private plants was shown by the production of 2,307 kilowatt hours per kilowatt capacity of the dynamos, as against 1,460 in the public plants. The private plants had an output of 154,874 kilowatt hours per person employed, while that of the public plants was only 67,190. The naked fact is that any way you figure it, the cost of producing the municipal current was greater than the private plants got for their product.

During the ten years from 1902 to 1912, although the number of public plants increased 91.7 per cent, while the private plants increased only 30.4 per cent, the income of public plants increased 233.4 per cent, while with only a third of the increase in private plants their income gained 254.2 per cent, at a rate per kilowatt hour greatly below that of the public plants. The expenses of the private plants increased 246.1 and the public plants 222.5 per cent, while the kilowatt capacity of the private plants increased 333.7 per cent and the public only 225.2. The comparative efficiency of the private plants was emphasized by a grain of 357.8 per cent in output as against 174.4 per cent in public plants.—*The Searchlight.*

"Ittle Pechus" Chews the Cord

Two husky telephone linemen with health and happiness clearly written on their features and figures, were seated on a grassy spot beneath a big tree enjoying their noon-day meal.

Their dinner pails contained real grub. There was an abundance of meat sandwiches, hard boiled eggs, ripe tomatoes, cheese (none of your fancy brands, just plain rat cheese), Bermuda onions, and big slabs of honest- to-goodness home made pie. Cream puffs, angel-food and other Willie-Boy dainties were conspicuous by their absence.

The one who was known as Bill kept smiling all through the pleasant process of putting himself on the outside of the contents of his dinner pail. After wiping his capacious mouth with the back of his big hand, he burst out into a hearty laugh. Seeing nothing in sight to cause even a smile, his comrade said: "For the love of Mike, what's the matter with you? Have you gone nutty, or do you hurt inside somewhere? You've been doing nothing but set here and grin like some he-society bud ever since you clumb down that pole."

Bill cut loose with another hearty laugh before replying. "Do you know," he said, "I just can't help thinking of the funny things that happened yesterday. While I was slipping on my overalls, old man Earle busts out of his office and tells me to beat it out to a house on Washington street, where a woman friend of his wife's was raising thunder because her telephone wouldn't work. When I gets there I found a handsome girl baby somewheres about a year and a half old, chewing on the receiver cord. I tries to take it away from her gentle-like, but she just yells all the louder. The mother, kinda grumpy looking, allows as how she wishes I would fix the telephone without disturbing 'Ittle Pechus' so much. Pretty soon the kid gets interested in my climbers and stops masticatin' the green cord long enough to plant herself on the floor right between my boots, making me feel right foolish. The minute I got my hand on that cord I knowed where the trouble was. The kid had sucked it so much it was soaked and the wires in the cord were crossed. I put a new cord on and told the woman not to let the kid suck it no more. She said she guessed she knowed how to raise children without getting advice from a lineman, especially an old bachelor lineman. Think of it, Jake, and me with seven kids at home looking like a pair of steps!"

Food Saving Co-operation

A plant superintendent undertook to have all his employees co-operate in food saving, and urged upon them the gospel of the wheatless meal, the meatless meal, and the clean plate. He went to them with a definite plan—*his* plan—and the response was disappointing. They seemed to wonder what the superintendent was trying to "put over."

Then the president of the company tackled the problem, and his conception of leadership was somewhat different. He made no plan, and said nothing whatever to employees direct, but quietly spread about the factory a suggestion that food saving was one of the main issues in winning the war, and that a body of employees of such intelligence and patriotic spirit ought to do something striking by way of co-operation.

In a few days this factory force originated a plan which was much better than anything the president or superintendent could have devised, and it went through the works, and was backed by workers enthusiastically, because it was *their* plan.

The moral of this story is obvious:

Be a leader in food saving, but do not forget that the best form of leadership is often that which originates with those who are led.

Georgia Squirrels Eat Cables

While it was well known that the large colony of squirrels at Thomasville were active in their attacks upon the pecans grown there, it was a surprise to learn that they had gone so far as to attack the telephone wires, but such has been found to be the case. When complaints were sent in of trouble in one of the residential sections of the city and the telephone company went to locate it the lead in one of the large cables was found to have been gnawed three-eighths of an inch deep by the sharp teeth of the squirrels. The little animals have recently become very plentiful all around town, presumably coming on account of the numerous pecan groves. They have so far been left unmolested, but there is talk now of squirrel pie as an inviting delicacy.

Thrift

Thrift in its natural aspect tends to the elimination of the vast waste which now exists in our country; waste in resources—waste in production—waste in distribution—waste in expenditure—waste in unemployment—and just as thrift builds up the best in the individual character, so it must build up the best in national character—but as national thrift must depend largely on individual thrift, it becomes our patriotic duty to be thrifty. If we love our flag and all that it stands for—and all that we know it must stand for, in the decades that are to come, we will be thrifty, for thrift is patriotism—the patient, plodding heroism that comes in the every day life of our citizens.

It was Robert Louis Stevenson who said: "Happiness consists in earning a little and spending a little less"—but thrift, as we understand it in its broadest sense, must go further than the words of the poet. There must be thrift in every resource at our command. There must be thrift of health—thrift of time—thrift of energy—as well as thrift of money. President Wilson covered the ground well when he said: "If a man does not provide for his children—if he does not provide for all who are dependent upon him—and if he has not that vision of conditions to come, and that care for the days that have not yet dawned, which we sum up in the idea of thrift and savings—then he has not opened his eyes to any adequate conception of human life. We are in the world not to provide for ourselves alone, but for others, and that is the basis of economy—so that thrift and economy, and everything which ministers to thrift and economy, supply the foundations of national life."—S. W. Strauss, in *National Union Advocate.*

Wireless Telegraphy in Scandinavia

It is announced in "Lloyd's List and Shipping Gazette" that a large radio-telegraph station has recently been erected at Karlsborg, in Sweden.

The station has a radius of 5,000 kilometres (about 3,100 miles), and will thus be able to communicate directly with America.

In addition to the Gothenburg and Carlscrona stations three others are being built in Sweden—at Boden, Hernosand and Vaxholm, near Stockholm. The station at Karlsborg has two masts, each 210 metres high. The aerials between the masts consist of six wires 450 metres long. The electric current is supplied from the Trollhattan hydroelectric power station, and is converted at the station to a periodicity of 15,000.

In Norway the Stavanger station is nearly finished. It will be able to communicate with America, where the Marconi Co. has built a sister station. Its radius will be equal to that of Karlsborg.

Rundemand station, near Bergen, with a radius of 800 to 1,100 kilometres, has been in use some time, and Tryvand station, near Christiania, will be ready in the near future.

Duty of Lighting Company

In a telephone lineman's action for injuries resulting from coming in contact with high-voltage wires, evidence was held to show that the telephone company's pole on which he was working at the time of the injury was erected after the electric light company's pole adjacent thereto, and that at that time the electric company's high-voltage wires were already in place. After erection of a telephone pole in close proximity to an electric light pole it became the electric company's duty to remove its high-voltage wires to the outer ends of its crossbeams for the protection of telephone linemen and in accordance with the usual custom, the Court of Civil Appeals of Texas held in City of Weatherford Water, Light & Ice Company versus Veit (196 S. W. 986). An electric light company owes a duty to its employees to place its high-voltage wires on the outer ends of its cross-beams for their protection and in accordance with the usual practice. After a telephone pole was erected in close proximity to an electric light pole it was the electric company's duty toward the telephone company's employees to inspect the insulation of its high-tension wires.

A Telephone Sound Augmenter

In the improved type of apparatus a mica disc diaphragm is used; round this is a thin brass ring. Radiating from this, top and bottom, are a series of elastic cords fixed to adjusting screws at top and bottom of sound board. On these elastic cords are strung a number of brass discs about ½ inch diameter or square, made of rack brass (rack brass such as used for rack and pinion clock work, about ¼ inch thick), the rack edge of one piece resting on plain side of the other. Between these are placed a few carbon granules, the first and last brass discs on each elastic cord making metallic connection with the brass hinge and adjusting screws. Carbon discs or squares can be also used if one of the sides of each carbon disc has a few saw-cuts made in it, so as to form a "rack" edge exactly like the brass. Of course, brass or carbon discs have to have a hole through the center to permit them to be strung on the elastic cords.—*Charles Mayfield, in the English Mechanic.*

Wireless at the Front

Although very little has been permitted to pass the censors, it is understood that wireless is being employed to an unprecedented degree on the battle front in France. In the front line trenches the aerial wires are strung along a parapet just behind the barricade. In the support trenches the aerial wires are elevated a few feet above the ground, while far to the rear the aerial is generally elevated to about twenty feet by light bamboo poles. The sectional masts familiar to our army pack sets and wagon sets are practically unknown in the war zone, for the reason that a modest aerial a few feet above the ground is sufficient for the short ranges which must be covered. Wireless telegraphy is a necessity in communication work, because of the difficulty of laying telephone and telegraph lines and then maintaining them across shell-sprayed terrain.

Avoid Using Term "Delinquent"

Discontinue the use of the word "delinquent," says the *Telephone News.* A subscriber whose service had been disconnected for non-payment of rental recently reported his telephone out of order and was told he was on the delinquent list.

He took the matter to court and obtained damages. It is a serious matter to tell subscribers they are delinquent. Look up the meaning of the word. It is better to call it "Overdue Account."

Flux-Density and Permeability

By August Hund*

The method described is well adapted to the measurement of permeability and magnetic induction in test samples at any desired frequency.

The samples to be tested are compared with a known and progressively variable self-induction, or "variometer" consisting of air-core coils, in series with a non-inductive resistance. The performance of the differential system is based upon the following principle:

When the currents in the two branches of the system are equal in effective value and in phase their inductive effects on the secondary coil of the differential transformer will exactly neutralize each other, and no voltage will be reduced in the coil. The two primary coils (P_1 and P_2) are symmetrically placed with reference to the secondary coil S, and have exactly the same number of turns, which are wound in opposite directions. Any kind of alternating-current detector connected across the terminals of the secondary coil will then give a no-current indication when the currents P_1 and P_2 are equal and in phase (see diagram).

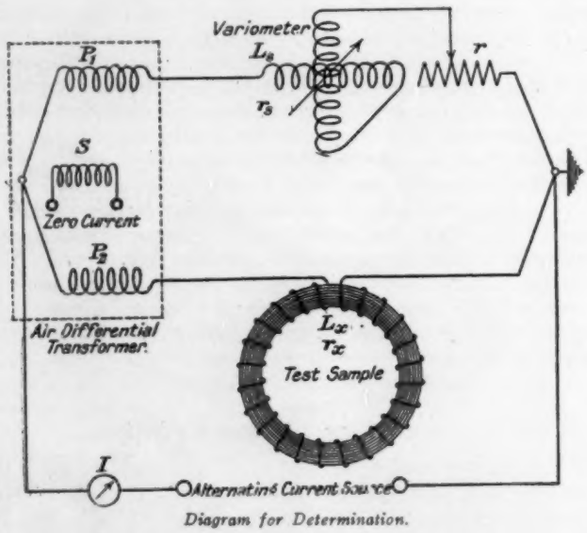


Diagram for Determination.

A no-current adjustment is established when the coefficient of self-induction of the variometer is equal to the effective coefficient of self-induction of the test coil, and when the effective resistance of the test coil is also exactly balanced by the resistance of the variometer and the series resistance r. An absolute disappearance of the differential field, however, can generally not be obtained, since the wave-form in the one branch is somewhat distorted, due to the presence of the ferro-magnetic substance; but in most practical cases the minimum of the differential field can be very readily and accurately detected. For very precise measurements it is advantageous to insert a condenser in series with the indicator in the secondary circuit of the differential transformer, and tune this circuit to resonance with the required frequency. (This is especially recommended at higher frequencies, since tuning is then readily obtainable.) For frequencies up to about 2,000 cycles a Wien vibration galvanometer may be used as a current indicator and the condenser dispensed with.

Starting from the usual relation for the E. M. F. induced by a flux, B_{max}, in a given number of turns as a specified frequency, he deduces the relation

$$B_{max.}=0.7075.\frac{L_s(\text{henrys})}{NS(\text{cm.}^2)}.I(\text{amps.}).10^8 \text{ lines per sq. cm.,}$$

L_s being the coefficient of self-induction as read on the variometer, N the number of turns in test sample, S the cross-section of iron core, and I the current as measured by the ammeter in the main branch of the differential arrangement. The constant in the equation is based on the assumption of a sine wave; otherwise appropriate correction must be made for the form factor.

Similarly, the maximum magnetizing force H is defined by the formula

$$H_{max.}=\frac{4\pi}{10}\sqrt{2}\frac{NI_m(\text{amps.})}{l(\text{cm.})} \text{ gilberts per cm.,}$$

where I_m is the magnetizing component of the effective current traversing the coil of the sample and l the mean length of the magnetic path in centimeters.

The author then proceeds to discuss by the aid of vector diagrams and mathematical equations the relations between applied voltage, magnetizing current and flux, and ultimately deduce the following detail relations for $H_{max.}$ and μ, the permeability

$$H_{max.}=k_4 I \text{ (amps.)}\sqrt{1-\left(\frac{\Delta r_c(\text{ohm})}{2(\text{ohm.})}\right)^2} \text{ gilberts per cm.,}$$

$$\text{and } \mu=k_5\frac{L_s(\text{henrys})}{\sqrt{1-\left(\frac{\Delta r_c(\text{ohm})}{2(\text{ohm})}\right)^2}}$$

In these equations $k_4=0.8875\,\frac{N}{l(\text{cm.})}$,

$$k_5=0.798\times 10_8\times\frac{l(\text{cm.})}{N^2S(\text{cm.})^2}$$

Z is the resistance operator of variometer resistance combination. Δr_c is the increase of resistance of the test sample caused by iron loss.

It is also shown how, on certain assumptions, relations for the iron (hysteresis and eddy current) losses in the sample can be determined. The conditions to be aimed at in securing a satisfactory differential arrangement and the various disturbing factors are also discussed in some detail.

It is pointed out that the arrangement readily enables $B_{max.}$ values to be compared for very long wave-lengths with the corresponding values determined at higher frequencies, and an insight thus obtained into the skin effect of an iron core. As stated, the various iron losses can also be analyzed at different frequencies; in particular, the dependence of the magnetizing force and permeability on the frequency of the applied alternating E. M. F. can be conveniently studied.

*Abstract of a contribution to the "Proceedings" of the Radio-Institute of Institute of Radio Engineers (New York).

The Telephone in Spain

It is stated that a scheme has been prepared by the Spanish director-general of communications for the reform of the national telephone system.

The scheme proposes to establish telephone offices in the greater number of town and rural communities hitherto unprovided with services, which now only exist in 108 of the principal cities and towns. To carry out this project, it is proposed to impose on the provincial deputations the obligation to contribute up to 20 per cent of the cost of their respective networks, and to call into being a National Telephone Institution with power to raise 60,000,000 pesetas, the estimated amount which the 40 provincial networks would cost, including the purchase of existing private rural lines.

The Telephone In Modern Drama

Paper read before the London Telephonists' Society

BY CELIA KATE HOOPER

IN order that the influence of the telephone upon modern drama can be satisfactorily shown it will be necessary to touch very briefly on its evolution.

All forms of dramatic art had their origin in religious observances and were intended to give religious instruction to the people. In India the dance, accompanied by songs, performed in honor of the gods was the earliest form of drama, to which that of the Ancient Greeks is closely allied. While the Indian god Krishna was the hero of Indian drama, Dionysus was the center of Greek dramatic art, and in both countries scenes of national importance were introduced as time went on.

Dramatic art made its first appearance in England at the Norman Conquest. The monks who came over with the Conqueror introduced a number of religious plays to the English monasteries and for some time these were kept wholly in the hands of the church. As time went on church processions and religious festivals sprang up, festivals which contained not only religious but also secular and pagan elements, which were the result, on the one hand, of the desire on the part of the priest to enlighten the people and, on the other, of the people to enjoy the splendid shows. In this way came into being the miracle plays acted by the priests, dramatic compositions the subjects of which were legends of the lives of the saints, or the mystery plays dealing with scriptural events.

These plays eventually passed into the hands of the laity and were performed by the trade guilds on feasts and holidays. The actors did not scruple to introduce a considerable amount of buffoonery by way of comic relief, the most amusing of the *dramatis personæ* being the devil himself. The moral plays followed, allegories in which the characters—such as Vive, Virtue, Envy or Pride—were intended to convey a lesson for the better conduct of human life.

From these sources sprang our drama which, after it had broken away from the church, soon became strong and independent and repesentative of the life of the people and reached its zenith in the immortal plays of Shakespeare.

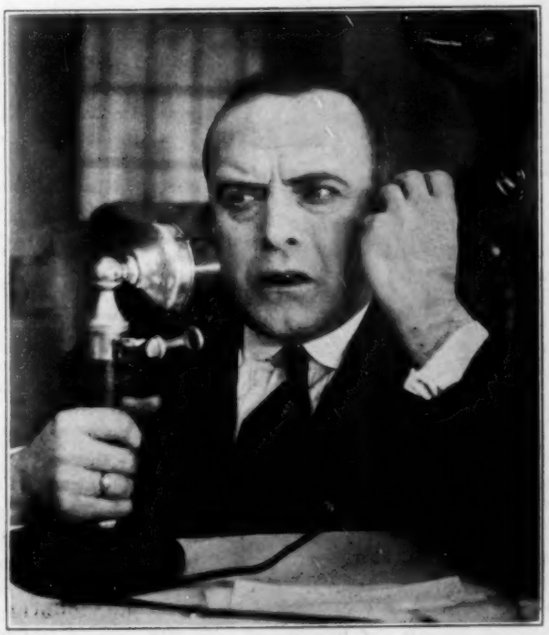
During the later development of the English drama a controversy arose between the classical school, imbued with the ancient rules of the Greeks (which had been resuscitated by the *Renaissance*) and the native dramatist who, though perhaps cognizant of what was required by the classical tradition, determined to keep himself free from its trammels. The greatest of these reactionaries, of course, was Shakespeare himself. The rules of the classical school were that the unities of time, place and action should be adhered to slavishly, consequently the choice of subject was limited and the dramatist was hampered in faithfully reproducing life in a natural and convincing manner.

It must be made clear, however, what limitations these unities imposed upon the playwright. It was contended that "the stage should always represent but one place, and the uttermost time pre-supposed in it should be but one day," and that the action should be continuous.

It will readily be seen that these placed insuperable difficulties in the way of the dramatist, especially in the production of historical plays, and Shakespeare as a general rule snapped his fingers at them.

But these unities undoubtedly present an ideal which makes for the production of a play in a sense more perfect. The introduction of the telephone into modern life and, consequently, into modern drama has, in a measure, helped the dramatist to observe the unities more closely now than he has done in the past, in spite of all the added complexities which have sprung up in the meantime.

Apart from any secondary object he may have in view the prime endeavor of the dramatist is to hold up the mirror to nature. It is his business to reflect in his plays with the utmost fidelity the life of the time he presents. He must reproduce the thought then current; record the feelings that his characters would experience under given circumstances; reproduce the language they would use, and the situations they would encounter; and place them in the surroundings which would be their natural environment, employing—where necessary—all the various accessories of their existence such as costumes, jewelry, buildings, furniture and household appliances. Of these appliances he will naturally select those most calculated to produce dramatic effect and, whether tragedy or comedy be his vein, he will eagerly seize upon any device likely to produce a "situation," make for surprise, or hasten the development of the plot.



John Cumberland in Madge Kennedy's Production, "Baby Mine," on the Goldwyn Motion Picture Program.

The introduction of the telephone into modern life and its intimate associations with the world in which we live, move and have our being has made it imperative that any writer of modern drama shall bring the telephone into his plays if he wishes to reproduce faithfully the present time, for the present time may be said to be the "*age* of the telephone." Nor does the dramatist feel any disinclination to do this, for

he finds that he has had placed in his hands that very device which will assist in preserving the unities of time, place and action in a way which before was impossible. One of the difficulties with which he has always contended is the bridging of time in a manner sufficiently natural to prevent a feeling on the part of the audience that coincidence is being forced beyond the limits of probability or even possibility. He has always experienced a difficulty in explaining why a character should put in an appearance at a certain critical moment, or in informing the audience of things which are happening at a place far removed from the scene on the stage, but of which it is necessary they should be made aware.

In these respects the telephone has proved a welcome and powerful addition to his stock in trade. By the simple expedient of bringing the telephone on to the stage an effect is produced similar to that of its introduction into everyday life—everything is speeded up. It has made a rapid plot possible. It has helped to increase the number of complications and make them more complicated. Skilfully used it makes a sudden and dramatic *denouement* seem the most natural thing in the world and, above all, it can be made to keep the play and the plot together.

It is supposed that modern drama as used in this title is not intended to be used in any narrow sense, or to be restricted to what the purist would consider to be the drama proper, but that it may be allowed to embrace tragedy, comedy, burlesque, the sketch as performed nowadays upon the music-hall stage, and even to include the production of the picture theatre.

Examples will readily suggest themselves of plays in which the telephone has figured more or less prominently and has performed a function similar to those indicated above.

It is, of course, difficult to separate the effect due to the actor's skill from that of the properties he employs. That grim one-act tragedy in which Charles Warner is discovered on the stage listening at the telephone to a murder being committed at the other end of the line, in a room where the receiver has been left off the instrument, produces a situation which, while demanding the most skillful acting on the part of the actor, shows, nevertheless, the possibility of using the telephone for the purpose of drawing together, and placing before the audience at one time, actions which are taking place at two entirely different places and comes as a pleasant relief to the tedious harangue of the eye-witness, which has to be introduced with consummate skill if it is not to be absolutely boring and unnatural.

The complication of the plot is dramatically brought about in "The Case of Lady Camber," by Lady Camber answering a telephone call from her husband in the voice of her nurse who, she has reason to believe, is intriguing with him and so discovering his unfaithfulness.

The tapping of lines has been utilized both for comic and tragic effects, and the telephone was in "The Man Who Stayed at Home" made to serve the purpose of a private detective.

It seems hardly necessary to cite a case where the continuity of action is preserved by the introduction of some apposite telephonic communication. Almost every detective play of recent times will afford an example of the telephone performing this function, and indeed, it is certain, where a telephone is seen on the stage that it is there to assist the playwright over some difficulty which would otherwise have been insuperable within the limits imposed upon him. The part played by the telephone in "Within the Law" was a very important one in the most exciting and critical part of the play and enhanced its effect considerably.

The makers of farce and comedy in recent years have not been slow to see the possibility of humorous mistakes being made over the telephone, mistakes of time, of identity, and of the message itself, which may create a funny situation. Nor have makers of musical comedy or the revue been able to refrain from utilizing the telephone for the production of mirth. In "The Telephone Girl" and "Hullo Everybody" the sacred precincts of the telephone exchange have been invaded and the whole staff from the exchange manager to the doorkeeper have had the finger of fun pointed at them.

In the picture play the introduction of the telephone is so common that it would be thought that the film had been tampered with if no telephone made its appearance.

What then is the influence of the telephone upon the modern drama? As the telephone has invaded modern life so it has invaded modern drama; as it has enabled business and the affairs of life to be transacted with greater rapidity so its introduction upon the stage has hastened the action of the plays.

It has, incidentally, brought the dramatist nearer to the three unities of time, place and plot, and enabled him to produce a complex play not outside the bounds of probability.

As a last word it might be said that there is a tendency to overdo the telephone on the stage. If it is made use of to any greater extent it will become worn out as a dramatic device and will be denounced by the dramatic critic as a cheap and paltry means of eluding craftsmanship, except in extremely brilliant examples.

Girls for Railroad Operators

Girls may take the places of men as telegraph operators on the St. Lawrence and Ontario divisions of the New York Central in a short time. More than twenty young women have started to learn the code and the operation of telegraph instruments at the railroad station in Watertown, and company officials say that rapid progress is being made by the pupils.

The plan has been inaugurated in the hope that it may solve some of the problems resulting from the war. Shortage of operators is already being felt in some sections, and to prevent the possibility of actual tie-ups resulting from the lack of competent operators the railroad has started the class in which the young women are studying.

Many of the smaller branch stations have been closed because of the shortage of operators, and it is said that positions could be found for fifty operators. Young women have shown themselves apt at the work, and efforts are being made to secure more to take it up. As soon as they complete their courses they will be given positions along the railroad.

The instruction is conducted similar to any school. There are regular hours of attendance, some who work at other occupations for a part of the day, attending school during their hours off work. Others attend throughout the entire day. C. W. Bowdish is in charge of the instruction of the student operators.

It is expected that as rapidly as possible the women will be given positions at stations along both the St. Lawrence and Ontario divisions, and it is believed that before the end of the war, if the demand for men continues, the majority of the operators will be young women.

European Telephone Practice

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SHOLZ

SEMI-AUTOMATIC TELEPHONE SYSTEM AT AMSTERDAM: At Amsterdam, as is the case in all large cities in Holland, the telephone concessions and rights have been granted to the community by the state for a time of 25 years within a radius of 3 miles from the center of the city. The concession in the case of Amsterdam expires in 1921. The exploitation of the city telephone system then goes over into municipal ownership and the state takes over control over the interurban and the long distance telephone work. In this city a multiple switchboard with horizontal jacks was installed in 1895 and in 1905 this was changed to the c. b. system. This multiple switchboard has a capacity of about 12,000 jacks and is still in service at the present time. We have here an example of a switchboard equipment in use for over 17 years and still in good working condition, in spite of the unfavorable arrangement of the horizontal jacks which make service conditions for the operators rather difficult.

Adoption of the semi-automatic system: For the last few years this manual exchange had approached a point where traffic was too heavy to be accommodated and it became necessary to install a second exchange. To select a manual system for this new bureau meant to stand by this system to the end of the concession and then have the appraising made by the government on the basis of an unmodern telephone system. Then the automatic system was discussed, but also dropped for various reasons; and finally the semi-automatic system was selected. The following reasons were in point in making this selection:

1. There need be no change in the habits of the subscribers. This is a fairly important point with the Dutch, who are by nature more phlegmatic and slower to take up new innovations, a matter which is shared by a large majority of the public when called upon to adopt a new innovation.

2. The equipment could be kept and conserved.

3. The subscriber was assured an immediate response when calling, a point common to all systems with traffic distributing arrangements, which had been tested out with good success at Rotterdam.

4. The semi-automatic system had all the advantages of the complete automatic system: immediate disconnection; exploitation and length of conversation independent of the number of exchanges, etc.

The question was then finally decided as much on the ground of technical advantages as on the basis of financial arrangements. A survey, which was made, arranged for a semi-automatic exchange with a possible capacity of 10,000 lines and the eventual transformation of the old manual system into the newer one. The assured telephone traffic was set at 16 communications per day and per subscriber and 2 of these conversations taking place during the busiest hour of the day. The equipment was guaranteed for two years by the constructors. It was estimated that the annual total of expenditures for installation and upkeep per subsciber, including all depreciation, was $1.60 less for the semi-automatic than the manual system, and that the adoption of the complete automatic system would mean an expenditure less by $1.60 than that for the semi-automatic system.

The semi-automatic exchange: The installation is of the same type as that used in several of the large cities of Germany and is called commonly the Siemens & Halske system. The original installation, arranged for 1,500 lines included: 1,500 selector switches; 150 first selectors; 150 second selectors; 150 third selectors and 150 connectors. It was then extended to provide for a total of 100,000 subscribers. This is, of course, for future use and for the present the actual installation includes the above and an additional equipment for 4,000 lines. There are double selector switches installed in order to have as great an economy in working the selectors as is possible. There are here: 4,000 selector switches; 400 second selectors; 200 first selectors; 200 third selectors and 400 connectors. In spite of the adoption of double selecto switches, it seems that the traffic had grown with such strides as to make traffic rather cramped and that a larger number of selectors should have been chosen.

Method of Service: The subscriber retains his old c. b. telephone equipment. He calls the exchange by simply removing his receiver. As soon as the call is switched by one of the traffic regulators to a free operator, she is automatically in communication with the subscriber ready to hear his number without having to make any manual operation at all. The reply on the part of the operator is therefore assured with the minimum delay. From the moment that her indicator call lamp flashes, the operator is in connection with the subscriber and makes the automatic connection by means of her keyboard. Each keyboard carries 5 series of 10 buttons. As soon as she has set her buttons and has released the automatic switching of the numbers called for, the operator is free to tend to another call. The communication is now carried out exactly as with the automatic system, without the operator being able to interfere in the conversation nor to supervise it. The current impulses necessary to move the selectors and connector wanted are sent automatically, after being started by a release key at the keyboard. Counting of the call is done automatically as soon as the called subscriber has answered.

Disconnecting the call is done automatically. At Amsterdam it is controlled partly by the calling subscriber, partly by the called subscriber. The former liberates all the equipment up to the final connector and the second liberates them all up to the first selectors. It must be noted that the system with "forced disconnection" was not applicable in the case of the semi-automatic telephone system owing to the absence of the number dial discs of the equipment of the subscriber. For that reason it was deemed wiser to adopt the system with selective disconnecting, subject to the desire of each subscriber talking over the telephone. The only inconvenience noted with this system is the untimely cutting off of connections by the hanging up of the receiver on the part of one or the other of the subscribers conversing. But as at Amsterdam the toll rates are paid in bulk, it does not make very much difference even if conversation is cut off. The advantage of this system is, that no line can be blocked against other calls through the neglect of a subscriber in not hanging up his receiver.

Each set of keys of the operator is locked during the

entire duration of the working of the selector switches. But the operator herself is free as soon as she has pressed down the release key and when the current impulses are sent over the various selectors. It is for this reason, that each operator is provided with two sets of keys, in order that she can receive one call as soon as another one has been finished by her. In case the first keyboard is busy, the call is turned over automatically to the second one. The operating staff can thus be utilized to the fullest extent. It has been established after numerous tests, that the best as also the simplest system to effect the distribution of traffic, is to distribute the incoming calls at random anywhere over free keysets, without any distinction between the two sets in the same board.

Audible Signals: The calling subscriber always receives an audible signal, assuring him that the connection is being made. If the desired subscriber is not free, he receives a busy signal and if he is free, he receives a signal, showing him that the call current is being sent to the wire asked for. If he receives no signal at all, he knows that there is something wrong in the equipment and he will call up the information operator or the manager. In case one of the two subscribers hangs up his receiver during the conversation and thus brings about partial disconnecting of the apparatus, the subscriber who remains on the wire, receives a finishing audible signal. He will have to hang up his receiver again and take it off and make a new call in order to get the subscriber back again.

Traffic Regulation Table: In cases where none of the operators' keyboards are free, the calls, coming to the exchange are received at jacks provided with call lamps and ranged at a special traffic control table, which plays the role of a temporary regulator of traffic. During the hours of feeble traffic the calls coming in like this are left waiting and are switched automatically towards free key sets. But during the very busy traffic hours, when a very large number of calls come in simultaneously, these cannot be left to themselves on the chance that they will find a free key set. The reason for this is, that in such a case the order of priority is not observed and one subscriber might be waiting a longer time for a free operator, than another one. At such times an emergency operator is seated at the control table. She sends out the calls systematically to free operators, as quickly as they are available. All that is needed for this purpose is to touch with the tip end of a special plug the socket of each of the jacks, whose call lamp flashes, in the order as the flashes are produced. If the lamp does not flash, it is a sign that the keys are not free at that moment. The operator at the traffic control table will then take the call herself by the aid of a single cord and will use a special set of keys. Each first selector at this table has a jack and a lamp.

Relations to the Manual Exchange: The Amsterdam telephone system has two exchanges: the manual exchange (Nord) equipped for 12,000 places and the semi-automatic exchange (Sud) equipped for 4,000 places. Before opening the Sud exchange, a small auxiliary exchange holding about 600 subscribers had to be installed temporarily to relieve the old manual exchange. As soon as the second exchange was opened, the "division call" system was introduced among the subscribers. That is, in cases where the subscriber asked for a subscriber connected with another exchange, he asked for the operator in that exchange first, and only gave his number to her when she answered his call. Thanks to this method of making calls, relations between the two exchanges Sud and Nord were facilitated very much and every call coming for a subscriber of Sud is made by means of the key sets.

1. When a subscriber of *N* (manual exchange) asks for a subscriber of *S* (semi-automatic), the operator of the manual exchange makes a connection with the semi-automatic exchange by means of an interoffice trunk, which ends in a free second selector. The traffic controlling device then switches the call to one of the key sets and the semi-automatic operator then presses down the proper keys, after hearing the number asked for.

2. When an *S* subscriber asks for an *N* subscriber, the operator at his semi-automatic exchange presses down a special button on her key board, which connects the subscriber to one of the auxiliary lines of the first row of contact sets of the first selector. These lines connect with some local jacks provided with call lamps, with which the multiple manual switchboard is equipped.

The only difficulty which might arise is the following: When an *N* subscriber has asked for an *S* subscriber by mistake, he is in connection with a semi-automatic telephone operator, who has already pressed down the special key to send his call on to the *N* exchange. But as there are no first selectors on the line, but only second selectors, communication is not established and the two selectors remain motionless and useless. The subscriber not receiving an audible signal will note something wrong and will hang up his receiver and make another call.

Interurban Calls: The interurban telephone system is exploited by the state and is connected with the Dutch telegraph. Calls for connections are recorded by special operators. The subscriber is then called and connection made by special groups of trunks. At the semi-automatic exchange all the subscribers' lines pass over cut-off jacks placed on the intermediate manual groups. When a line is connected to the interurban exchange it is completely separated from the automatic equipment. This precaution has been taken to avoid all trouble between the two exploiters of the system, the state and the community, in case there is trouble with connections.

When a subscriber called for by the interurban exchange is busy with a local call in process of conversation, the operator of the intermediate group connects herself to a listening position by means of a cord provided with a special plug, which does not break the connection. She then warns the two subscribers that one of them is being asked for on long distance and at the same time establishes the long distance communication by cutting off the present conversation with her cut-off jack.

Service of Semi-automatic Operators: The telephone traffic during the first three months of the opening of the new exchange was as follows:

Conversations asked for by *S* for *S*.....19.7%
Conversations asked for by *S* for *N*.....46.6%
Conversations asked for by *N* for *S*.....33.7%

The average number of calls sent out and received per subscriber was 13.7.

The daily average for calls asked for by subscribers was 9.1, approaching 11.

The average number of connections made per hour by an operator, between 8 a. m. and 10 p. m. was 418.

The average service per operator during the busiest traffic hour (10 to 11) was 576.

The maximum service given during normal service conditions has been 3,012 communications within one hour, made by four operators, giving about 753 calls per operator.

In a service test tried out with the operators, an ex-

ceptionally well trained operator was able to make 900 communications.

It should be noted that these figures ought to be somewhat higher than those usually mentioned for semi-automatic operators. The reason is, because all the connections asked for by *S* for *N* (and there are quite a lot of them) take only one button for service instead of five buttons, which accounts for the gain in time. But one should also consider that this gain is very slight, as in reality the working of five buttons is nothing but a complex movement, to be judged like a unit movement, which takes about the same time as a verbal communication, and that the five buttons are worked as one. At Amsterdam it was figured that if the operators were sufficiently trained, an average of 500 calls an hour could easily be reached.

Length of Wait: Investigations were made to see how much time was consumed between the moment when the call lamp of the key sets flashed, and that time when the release button was pressed down by the operator, which starts the automatic movement. Thirty-seven tests were made on a subscriber's line and the time varied between 2 and 6 seconds. The average time was 2.73 seconds.

Exchange Equipment: Each keyset contains five series of ten buttons. In each one of the series, when a button has been pushed down, the one just pushed previously is released again, while the last one pushed down remains locked. The operator thus will always know which is the last button she just pushed and can correct an error, which she may have made. The release key which starts off the automatic switching movement is not pressed down and cannot be used until the last unit button has been pushed. The equipment of an operator's keyboard is seen in Fig. 1.

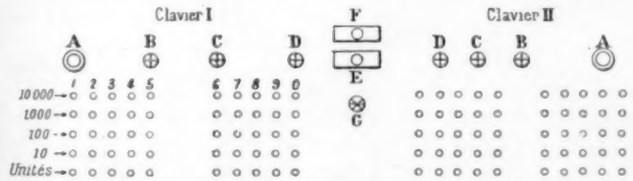


Fig. 1. Semi-Automatic Keyboard.

In this figure *A* is the button connecting with the manual exchange. *B* is the white call lamp. *C* is the red "busy" lamp for the key set. *D* is the trouble lamp, which indicates trouble in the wiring and equipment. *E* is the key, allowing listening-in by the operator in case of trouble with equipment (the operator uses this also to inform the subscriber to call again after hanging up his receiver). *F* is the connecting key. *G* is the pilot lamp indicating simultaneous busy condition of both sets of keys.

In case the switching system is out of order and does not function, the lamp *D* flashes and the operator, using *EA* simultaneously, informs the testing table on which a green lamp flashes, corresponding to her keys, and a white lamp flashes, corresponding to the selector out of order.

The selector switches, the selectors and connectors are like those in the German Siemens & Halske system. The selector switches installed here are of a fairly recent model. After disconnecting, the apparatus does not return to its rest position, but it remains in the position which it took during the preceding connection. Thus certain inconveniences of the old system are avoided. In order to find the location of trouble, one can verify the selector switches in good condition by the aid of a switch common to each group of 50 sets. The working of this switch flashes the indicator lamps of every selector switch in good working order.

The traffic distributor, which distributes the calls among the free key sets, is made up of a group of selector switches. It is the intention to try out a new model, which will be analogous to that actually in service, but whose wipers would try out 25 triple contacts instead of 10. By the aid of one of these devices for each of the first selectors, one could distribute all the calls between 25 key sets without using second selectors.

Impulse Senders: An automatic impulse sender corresponds to each key and this produces on the line the generation of current impulses corresponding to the number set up with the aid of the buttons. In general the system is the same as that in any other semi-automatic one. It is the intention to try and replace the distributors by a system of relays, avoiding the magnetic throwing into gear of the system and avoiding the necessity of having the permanent rotation movement now used.

Subscriber's Telephones: There are two types of sets in use, desk sets and wall sets. There is also a newer type in which the receiver and transmitter are on the same handle. In the working position, the apparatus is always shunted through the winding of the bell. This precaution was thought necessary to avoid untimely disconnecting which might produce a momentary cutting off of the microphone. Almost all the equipment used in the city is manufactured by the Ericsson Company of Stockholm, Sweden.

Toll Rates: At the present time the payment by subscribers is by bulk rate, costing $28.00 a year. There is a movement on foot, however, of charging by number of calls. To that end the service demanded by each of the subscribers will be verified periodically, perhaps twice a year, during several successive days. Then it would be possible to arrange a schedule of rates, charging a higher rate for those using more service, and lower rates for those with less service.

Service: Day and night service is assured in the exchange, in case mechanical trouble is experienced, through the employment of three mechanics with their apprentices. Each of the three men gives eight hours of service, making a complete shift of 24 hours. Before the exchange was opened three of these men had been sent to the workshops of the manufacturers to study the construction of the apparatus from beginning to end. They were also present at the installation of the equipment and therefore were expert in this system. The operating results during the first five months of operation were as follows:

	Jan.	*Feb.*	*March*	*April*	*May*
Number of actual subscribers.....	1,337	1,361	1,381	1,403	1,755
Number of connections made by *S*, the semi-automatic exchange...	573,481	569,276	588,191	555,785	760,168
Disturbance in the lines.....	0.29	0.26	0.3	0.17	0.19
Trouble at exchange.....	0.17	0.21	0.13	0.12	0.28
Trouble at subscribers' telephone..	8.39	0.34	0.37	0.32	0.31
Trouble from unknown causes.....	0.21	0.23	0.13	0.19	0.18

It was estimated that it would take one mechanic per 1,000 subscribers' line to keep the service going during the day and at night one mechanic per 10,000 lines.

General Service Conditions: The party line system has as yet been used in Holland only in what is known as the secondary centers. As the exploiting party in this case is not the state, these centers cannot be extended further than they are at the present time. As the humidity of the climate in Holland is very high, prepayment telephones can only be put in heated kiosks and for this purpose there is no money. Consequently there are no prepayment stations, which can be used by the general public. Any subscriber has the privilege to have his telephone used by outsiders if he feels so inclined. Several of the telephones in public buildings found in large cities are under the administration of a paid attendant, usually a small dealer, who receives 20 per cent of the receipts for calls made over his telephone.

The manual exchange *N* has a capacity for 12,000 lines, of which about 10,000 are in use. The number of operators on duty varies with traffic conditions. All of the operators are not always on duty and it has sometimes happened that operators have had to tend to three different places to answer calls. The total personnel in the system is 91 operators, divided into 13 sets of seven each, who look after the work during the hours of day and night service.

The entire rotation of working hours takes 13 days, divided as follows: During eleven days, 7 hours of work, with off-hours of 3-hour and 4-hour duration and perfect liberty of action of 2 hours. During the two vacations just mentioned (3 and 4 hours) there is allowed one-fourth hour in each one for lying down in the rest room. On the twelfth day, there is a 3-hour off-period in the morning. Then there is an off-period from 1 to 4 o'clock in the afternoon and the operators are free after that from 10 p. m. till 8 o'clock the next morning. The thirteenth day is entirely free.

The operators are paid as follows: (It should be noted that these are under conditions entirely different from our own, hence the disproportionate rate.) Operators while learning are paid $3.20 a week; time of apprenticeship limited to six months. Operators who have been with the company one year, i. e. six months as apprentices and six months as operators receive $4.80 a week. Operators in regular standing receive $7.20 a week, with an increase of 80 cents a week every second year. Married women are not admitted to service. There is a supervisor over every set of 20 operators and the entire feminine staff is under the direction of a chief operator. The average service on the manual board is about 130 connections per operator per hour. The average number during the busiest hour is 154. It has been figured that at Amsterdam an exceptional operator can make 230 connections in an hour.—*Annales des Telegraphes et Telephones.*

VOCATIONAL DISEASES IN ELECTRICAL FIELDS.

Vocational diseases embrace all injuries to health which appear in connection with a certain type of work trical engineers, the observation has been made that with and which are peculiar to that profession. With electlonger periods of work at switchboards in testing laboratories, in which high tension tests are made, they suffer with headaches, loss of appetite and digestive troubles. The continuous demand on the faculties of observation and the danger associated with the least error when working with high tension apparatus has been traced as causes for heart trouble and extreme nervousness. Frequent periods of off-hours and motion out in the fresh air are mentioned as remedies.

As the lead in the manufacture of lead storage batteries plays an important role, the workmen in such factories are quite exposed to lead poisoning. This shows up in chronic disturbances of the action of the kidneys and the stomach, as also in very pronounced effects on the nervous system. The best prevention against such poisoning is cleanliness on the part of the workman, good food and long periods spent in the open air.

Those working with electrical welding apparatus and with the testing of arc lamps feel the effect of the powerful light rays, which irritate the eyes and lead to inflammation of the conjunctiva and the lens and eventually to a grey cataract.

A number of vocational diseases can be traced back to the excessive use of one muscle or nerve to the exclusion of another. Thus motormen on cars suffer with a painful swelling of the muscles in the kneejoints and ankle joints in the right leg, owing to the constant pushing down of the car bell or the door opening devices. The term "telegraphers' disease" has been applied to that nervous cramp sometimes experienced by Morse operators, who have been in service many years. The first stages are cramps in the fingers and the arm, later the central nervous system is involved. According to the Swiss statistics more than 5 per cent of all operators have been subject to this trouble. The wireless operators on board ship are not much better off. They suffer of anemia, headaches and excessive nervous irritation. The causes are partly the lack of movement, cramped up as the men are in the narrow ship's space; and the excessive ozonization of the air in the cabin by the high tension currents also is to blame.

The operators working in telephone exchanges use really only three senses all the time, the sense of hearing, of sight and of speech. Their attention is constantly taken up and with several calls, their attention has to be distributed over more than one area. If they lack the needed concentration and rest, they are sometimes subject to neurasthenia. The influences of high tensions on the low tension telephone lines are also mentioned. Often there are disagreeable noises, like clicking and cracking in the receiver, which might lead to injury to the eardrum unless the operator was physically sound in that respect. Most of the troubles over the telephone that apply to this discussion are condenser effects. A receiver held to the ear may be looked upon as a series of two condensers, i. e., 1, receiver winding—insulation of the winding (dielectric)—pole shoes and metal casing, and 2, metal casing and diaphragm — auditory organ (dielectric) — human body. The effect of the electricity stored up in these two condensers is eliminated by a very simple arrangement, by which the metal parts of the receiver not belonging to the current circuit are grounded. The grounding of the metal parts of the casing effects, that the dangerous charges that might occur in the first condenser are made harmless, so that they cannot endanger the second condenser, which in this case is the human body.

In view of the tremendous use of electricity and its applications, the typical vocational diseases here mentioned are so small that they can be neglected for practical purposes. Electrical engineering can certainly not be classed among the dangerous occupations. If there is a certain element of danger, it is traceable to the ignorance of those handling high tension apparatus, which should never be entrusted except to those thoroughly familiar with its use and care.—*Schweizerische Elektrotechnische Zeitschrift.*

Many Poles Down in South

Plant Foreman Rogers for the Greenville, Miss., district of the Cumberland Telephone & Telegraph Company, returning from an inspection of the wreck of wires and poles north of Greenville, says the heavy sleet on the wires with the wind simply crushed the poles in places, 2,100 of the poles being on the ground between Greenville and Memphis. He estimates that probably $50,000 will be the cost of restoring the lines to their normal condition.

Six crews were put at work under a superintendent from New Orleans in the effort to bring order out of chaos and restore communication with Memphis.

The heaviest damage was in and around Clarksdale.

Chicago Has Best Year

Chicago Telephone Company in the twelve months ended December 31 last had the best year in its history, gross earnings approximating $21,483,906, compared with $19,672,718 in 1916. The figures are obtainable through compilation of the monthly earnings reports made complete yesterday with the publication of the December statement. Operating expenses, however, kept pace with the revenues, as they increased from $15,259,603 to around $16,500,000. Net revenues for the twelve months of 1917 were approximately $4,991,086.

In addition, dividend requirements on the company's capital stock were $2,500,000, compared with $2,220,000 in 1916. Operating income for the twelve months of 1917 was in the neighborhood of $3,558,632.

December was an exceptionally good month for the company, total revenues being second only to January. The statement for the final month of 1917 compares with 1916 as follows:

	December, 1917.	Increase.
Stations in service at end of month	594,054	33,971
Operating revenues	$1,825,760	$ 85,051
Operating expenses	1,392,814	158,588
Net operating revenues	432,946	*73,536
Uncollectible revenues and taxes assignable to operations	102,852	*37,696
Operating income	330,093	*35,840
Increase in capital items	1,129,294	571,925

*Decrease.

For the purpose of comparing the three principal items of the telephone company's statement in 1917 with the previous year the changes by months are interesting. The figures follow:

	Gross Increase.	Net Decrease.	Op. Income Decrease.
January	$234,041	*$96,496	*$93,194
February	179,845	*14,722	740
March	189,905	*7,130	2,837
April	198,570	40,618	53,710
May	181,080	13,563	29,244
June	127,534	107,239	134,272
July	160,806	143,592	181,859
August	143,308	98,748	124,603
September	132,772	115,331	143,868
October	134,314	80,545	113,784
November	103,963	95,256	127,179
December	85,051	73,536	65,840

*Increase.

Storm Affects Chicago Service

Handicapped by a decreased force of operators, the Chicago Telephone Company was swamped January 12 with telephone calls because of the unwillingness of persons to leave the comfort of their homes to attend to business or social calls. The record blizzard of the season on that day tied up transportation lines and almost isolated the business district.

Instructions were given large hotels and corporations to curtail their service. At the Congress Hotel it was reported that the telephone company had refused to receive some calls.

At the office of the telephone company it was stated that the demand for service was increased 25 per cent and that the force of operators was only 80 per cent of normal.

In order not to endanger service many operators were lodged by the telephone company in downtown hotels.

Telephone communication to some western suburbs was reported to be crippled. The sudden change in temperature caused copper wires to snap in two.

From Saturday afternoon until Monday 175 operators made merry at the Hotel LaSalle as guests of the Chicago Telephone Company.

Uniforms for Operators

Telephone operators are needed for duty abroad with the American forces; young women who are physically fit, who speak both French and English fluently, and who are willing to be sent abroad. It is preferred they should have had experience in telephone switchboard operating, but opportunity to learn this will be offered in case an insufficient number apply who are skilled in both telephony and French.

The women selected will have uniforms of the same olive-drab as worn by officers and men in the army. The unit of telephone operators now being organized is the only unit composed of women which will actually wear army insignia. The uniform will include the army campaign hat, with the signal corps hat-cord, a long olive-drab cape, a medium-length coat on the same general lines as the present army service coat, an English walking-skirt, and tan shoes. The salaries offered range from fifty dollars for substitutes, sixty dollars for local operators and toll operators, and seventy-two dollars for supervisors, to a hundred and twenty-five dollars for chief operators, plus, in each instance, rations and quarters as accorded army nurses. Transportation will be furnished from their homes to Washington, and of course from Washington to the point abroad to which they will be sent.

Conserving Telephone Service

As a further step toward conserving telephone service in Atlanta, Ga., whose calling rate per station is the highest in the United States, the Southern Bell Telephone Company has asked the railroad commission for permission to discontinue telling people the time of day.

It is believed this single step in service conservation will relieve the switchboard of 12,000 calls a day by people who ask the operators what time it is. The operators always give them the correct time from the large Western Union clocks which hang in every exchange. The company is not required to perform this service, but it will not discontinue it without the permission of the railroad commission.

Telephone girls at Sandusky, Ohio, are refusing to tell people the time, saying they are considered "human clocks," receiving 5000 to 6000 calls in 24 hours. Instead of looking at the clock they call central. The girls claim the habit is growing and the sooner it is stopped the sooner the public will get better service.

Hooverizing the Telephone

A business firm in Washington, D. C., has adopted a war measure, which, it thinks, if taken up by other business establishments, will, to a small extent, "help win the war." This business firm has announced that it will not allow any telephone calls either incoming or outgoing to be made by any one connected with the establishment except calls necessary for the carrying on of the firm's business.

It is pointed out by members of the establishment that if this proposition were adopted by every one in the city of Washington it would materially relieve the congestion and delay in the necessary telephone service.

Old Rate Suit Settled

The decision of the Court of Appeals supporting the contention of the Appellate Division that Dr. Julius H. Kevand cannot recover damages from the New York Telephone Company for being deprived of service for three months because he was unwilling to stand for a raise in rates has caused considerable interest among those concerned in the test case of Dr. Dwight H. Murray, which is on the new Court of Appeals calendar and may be argued early this spring at Syracuse, N. Y.

Dr. Kevand framed his protest upon the contention that the telephone company was bound to furnish a customer within the quarter mile circuit a one-party business line at the maximum rate of $48 a year, payable in advance. This was in accordance with the company's contract with the city of Syracuse made in February, 1887. In the spring of 1913 a representative of the telephone company had a conference with Mayor Schoeneck, at which time he stated to the mayor that it was the intention of the company to increase the business rate for a one-party telephone in this city to $100 a year and residential rates proportionately, and that the company had a legal right so to do. The $100 rate was, however, decreased by a vote of the directors of the company to $80 within the mile circle.

Dr. Kevand was one of the telephone customers who refused to assent to the raise in rates, claiming, as did the city of Syracuse, that the old contract with the city still held. Accordingly for three months he was deprived of the city service. His instrument remained in his office and every day an attempt was made to call the office or make calls from it, but they were disregarded in both instances. Finally Dr. Kevand compromised by paying the increased rate with the understanding that he was doing so under protest.

His action was brought to recover a penalty against the company for the unlawful deprivation of the use of a public utility and a verdict was returned in his favor by a trial jury in Supreme court. This was later reversed by the Appellate division on appeal and now the judgment of the Appellate body has been affirmed by the highest court, Dr. Kevand finally losing his case.

North Dakota Committee Reports

In connection with the negotiations relating to the proposed conection which is sought to be made between the two telephone companies doing business in the city of Grand Forks, N. D., the following explanatory statement has been received from W. S. Whitman, chairman of the council committee having the matter in charge, and George A. Bangs, city attorney:

"Our attention has been called to a news article pertaining to negotiations of the Physical Connection Committee with the two telephone companies for connection of their respective systems in this city, which article states that the Tri State company has refused to meet the North Western company in certain agreements and has thus blocked further action on the part of the telephone committee.

"In order that the public may have a proper understanding of the situation and that both telephone companies may appear in the proper light, it is only fair to state that negotiations have not been broken off by either the Tri State or North Western company; that the North Western company has agreed to a physical connection for long distance messages under certain conditions, that the Tri State company has also agreed to this connection under certain conditions and the telephone committee is hopeful that the conditions imposed by each company will be agreed to by the other and arrangements completed for the long distance physical connection. So far neither telephone company has agreed to make the physical connection for an interchange of local calls.

"We feel that the same publicity should be given this statement as the article to which we refer, so that the public may know that the negotiations are still under way and that the committee feel that considerable progress has been made."

Scores Pennsylvania Law

W. H. Wilson of Erie, president of the Union Telephone Company, addressed members of the Western Pennsylvania Independent Telephone Association at the opening session of its tenth annual meeting in the Pitt Hotel at Pittsburgh, January 18.

Mr. Wilson asserted that the efficiency of the Independent telephone companies in the state was hampered by the stringent female employment laws, and urged proceedings to bring about a modification. He said that under the state laws it was impossible to employ a girl telephone operator under 18 years of age, and that further the law prohibited the operator working more than nine consecutive hours, or more than fifty-four hours a week.

He maintained that the toll operators were engaged in interstate traffic, and that as the telephone companies were common carriers, the question of employment should be a matter for discussion by the Interstate Commerce Commission and not the state authorities.

E. B. Fisher of Grand Rapids, Mich., chairman of the United States Independent Telephone Association, spoke briefly on the work of the national association.

F. B. MacKinnon of the United States association and the council of national defense also spoke.

No Calls for Two Minutes

An unusual occurrence is reported from the switchboard of the local telephone company at Idaho Falls, Ida., a city of 5,000. On the evening of Friday, January 4, from 9:27 to 9:29, there was not a call on the switchboard, either local or long distance. So unusual was this occurrence that the operators were struck with surprise. One of the operators, who has been in the service for some time, stated that this was her first experience of the kind. Some one was mean enough to ask: "What was the matter with all the women of the community for that two minutes?"

Minnesota Men Pledge Loyalty

A resolution pledging President Wilson and the government its undivided support in all plans for the prosecution of the war, was unanimously adopted by the Minnesota Independent Telephone Association in annual session at the West Hotel in Minneapolis. The Rev. Francis Jager addressed the association on conditions in Serbia and the Balkans.

The Bureau of Statistics, Interstate Commerce Commission, has made public a summary of 61 reports of revenues and expenses of telephone companies for the nine months ending with September, as follows:

	1917.	1916.	Increase.
Operating revenues	$236,327,100	$207,883,251	$28,443,849
Operating expenses	161,163,516	136,548,256	24,615,260

The number of company stations in service at the end of September, 1917, was 7,607,468, and at the end of September, 1916, 6,964,312.

Lecture on War Telephones

In a graphic and vivid talk on "The Telephone and the World War," delivered before the members of the New York Electrical Society on Thursday evening, January 24, H. J. Carroll, of the New York Telephone Compnay, related many stories of the quick wit and heroism displayed by the men who are serving the trench line telephone systems.

Soon after the meeting had been called to order in the auditorium of the Engineering Societies' building, Mr. Carroll was introduced and began his recital. He told of the manner in which barrage fire is regulated by men known as "linking officers" in the British armies. These officers push on after the infantry advance, laying wires and then telephoning back to battery commanders the location of the enemy, at the same time advising the distance the fire should be shifted to be effective. Explaining how carefully the wires are guarded, he said that all of the warring armies maintain telephone patrols, which constantly test, repair and protect the lines.

Approaching gas attacks, he continued, are detected by observers whose olfactory senses are abnormally acute. Stationed at the outposts, these men upon scenting the attack immediately telephone the alarm to the trenches, permitting the soldiers to don their protective masks before the deadly gas arrives. Listeners, in subterranean passageways dug under No Man's Land, he related, use an instrument similar to that employed by doctors in testing heart action. In this way, tunnelling and digging by the enemy, hundreds of yards away is detected and the word transmitted over the phone to the front lines telling of the location of the "moles."

He went into interesting detail about how the Belgians, Russians, French, Austrians and others depended on the telephone in the field. In this connection he told about the telephone central office which the Anzac troops had constructed at the Dardanelles. It was rudely put together, the walls and ceiling being entirely made from sand bags, rendering it safer when attacked.

In conclusion, Mr. Carroll described the work that has been cut out for the telephone and what it is already accomplishing here and with the American forces abroad. In connection with this work 12,000 competent operators had been organized into a special force to handle government messages throughout the nation. Also the organization of the army under General Pershing is linked by telephone all the way from the port of embarkation to the front line trenches. He closed by declaring the telephone to be the nerves, eyes and intelligence of the army and that the Signal Corps men would play a tremendous part in the business of "Kanning the Kaiser."

It was announced at the meeting that 220 new members had been secured as a result of the unrelenting membership campaign that is driving ahead for 500, with the slogan "Over the Top by June 1" as their incentive. Men from all electrical industries in the vicinity of New York City are eligible.

War Decreases British Efficiency

"The annual parliamentary review of the work of the postoffice department brought out the burdens that war has placed on the postal and telephone systems," says the London, Eng., *Sun*. "The results of the department's operations give the government a net revenue of about $125,000,000 annually after paying all expenses. Since the war opened it has been found impossible to maintain the same efficient telephone service as formerly. Nowadays it is almost impossible to get a telephone installed in an English home or office in less than six months to a year. This is one of the inconveniences of metropolitan life. The department is unable to find men to do the work. One curious result of this condition is the difficulty which people encounter when they propose to change their business locations or residences. A person who wants to move first finds out if there is a telephone in his proposed new location, and if there is not he does not move. Homes and business places are almost nailed down to the place where they have telephone service in operation, because of the impossibility of getting it installed in a new place. There is now a heavier demand than formerly upon the service. The government has made every effort to avoid the necessity of investing capital either in telephone or telegraph plants where it can be avoided. The result is that the telephone service, particularly in London, is execrably bad, and it is one of the illustrations of the general decline in organization efficiency that is unavoidable in such times."

Would Centralize Police Lines

J. B. Lambert, president of the American Association of Engineers, has a scheme to save the city of Chicago money by centralizing the telephone and telegraph system in use at the precinct police stations.

There are forty-five such stations and each of them employs three shifts of men, making 135 men in all. Their duties are to receive reports of patrolmen on beats, who telephone in from the signal boxes at regular intervals and so are kept in "sight" by the commanding officer of the precinct.

The system is a check of the men, for the signal box registers at the home office and there can be no "camouflage" about the officer's whereabouts. There, before the operator, the exact locality of the box is shown.

Mr. Lambert proposes to have the system simplified by having a general "central" which will connect with the outlying stations just as the fire system is centralized, and as big factories and stores do their work.

A saving of perhaps $74,000 a year could be effected, Mr. Lambert figures, should his plan be adopted. This in salaries. For from ten to fifteeh operators would be enough to run the "central," and three shifts would mean only thirty to forty-five.

Indiana "Wireless" Sold

A line of poles belonging to the Metropolitan Telephone & Telegraph Company, known facetiously as "Allen county's wireless telephone line," was disposed of at sheriff's sale at Fort Wayne, Ind., to satisfy unpaid taxes extending over a period of four or five years. The total amount received for the poles was $585. The poles were sold in lots according to the township in which they stood, with the exception of 63 on the new Allen county farm, which is in Perry and Eel River townships. These were purchased by the county commissioners for $53.21. The balance of the poles in Perry township were bought by Charles L. Tilden for $224.12, and those in Eel River by W. H. Soest of the Churubusco Telephone exchange for $72.67. The Home Telephone Company of Fort Wayne purchased those in Cedar Creek township for $100, the Fort Wayne & Northern Indiana Traction Company those in Springfield for $100, and Ray L. Harris secured those in Scipio for $35.

Telephone Rules Plainly Told

The following "Rules for the Use of the Telephone" were taken from the telephone directory of one of the sublicense companies which operates small exchanges in the territory of the Southern Bell. This manager tells the subscriber in no uncertain terms what he expects of him. There is a good deal of telephone philosophy in these instructions:

"The use of these lines for eavesdropping or conveying the sounds of music of any nature, phonographs, pianos, organs, mouths, crying children, etc., is strictly prohibited. Eavesdropping is very unmanly and unladylike and should not be indulged in. If you must do it, please hold your hand over the transmitter so that your presence will not be so plainly felt. Parents should not allow their children to interfere with the telephone in any way. You may think we do not know who you are, but sooner or later it comes out who is the guilty one, and rest assured we never feel good about you any more. You annoy your neighbor, make a fool out of yourself and injure the company by acting in these unbecoming ways. Central is required to listen at times and has instructions to disconnect any one who makes improper use of the lines. If you are persistent in making a nuisance of yourself then the penalty is removal of your telephone without further notice.

"Don't use the telephone during a thunderstorm. Obey this rule and your 'phone will remain in good shape and you will remain in good shape, and you will not get hurt.

"To answer: Don't say hello. That means less than nothing. Simply lift your ear-piece to your ear and say Johnnie Brown at 14, if that happens to be your name and number. Always ring one short ring when through talking; this notifies the operator that the line is open and can be used by some one else. Too many of our subscribers are slow in answering their rings. Please answer promptly and avoid delay.

"If the operator is slow to answer, don't get mad and say hard things to her; this only complicates matters, and unless things are just right with the next one that calls the operator may not be pleasant and your harsh words will thus be carried along from one to another all day long. The operator has over 200 subscribers to look after and you hardly appreciate the amount of work she has to do.

"One minute is long enough to talk, over three minutes will be charged for extra. We will, however, use some judgment in enforcing this rule. The purpose is to cut out useless gab and childish talk. Business always has preference.

"All the rates over the company's lines are for a conversation of three minutes and for each additional minute you talk you are charged extra in proportion to the distance. Remember this and don't kick when your toll bill is presented.

"Report all 'phone and line troubles to the manager. He is always ready to give you a hearing. If the line is broken, and you can make a temporary connection with a piece of wire, we will appreciate it. Don't try to fix your 'phone unless you want them out of fix forever—in this case you pay for them. The 'phones are rented to you, not sold, and any damages they receive while in your possession we will expect you to pay for.

"Operators do not have time to carry on conversations; please do not expect it of them. Don't make complaints to them; they are busy and cannot give you any satisfaction. Call the manager or general manager.

"Using vulgar or profane language is a punishable offense under the law and certainly unbecoming to men. A gentleman will not do it.

"Always hang up your receiver earpiece down when through talking, otherwise your batteries will be exhausted and your bells cut out. Ring off by giving the crank one turn.

"In dry weather it sometimes happens that the earth around the ground rods gets very dry. By digging a small hole around them, and pouring on two buckets of water twice a week you will greatly improve the service over your telephone.

"All subscribers are required to call the attention of Central to any message originating at their place which should be charged for. Any failure to comply with this rule looks like an attempt to defraud, whether intentional or not.

"It is a misdemeanor to shoot off insulators or to in any way damage, molest or interfere with the lines of this company. A reward of $25.00 will be paid for the arrest with proof to convice of any guilty party."—*Southern Telephone News.*

Chinese Telephone Systems

The first telegraph system in China was introduced in 1882, under the direction of a Danish expert; the private telegraph business was nationalized in 1908, and now the entire service is controlled by the Ministry of Communications. At the close of 1913 telegraph lines extended over 37,403 miles, with 51,129 miles of wire. Submarine cables, with the exception of the Woosung-Canton line, opened in the early part of 1915, are all under foreign control. The telephone service, inaugurated in 1903, consists of government (both central and provincial) and private undertakings. The control of both telegraph and telephone systems is practically in the hands of foreigners, from the circumstance that these systems were constructed by the aid of foreign capital.

According to the *Zeitschrift für Post und Telegraphie,* unofficial telephone services have not hitherto prospered in China for two reasons. First, although the Chinese are fond of using the telephone, it is found difficult to secure enough subscribers in any one place to support a local service. Second, the companies are exposed to the competition of the telegraph service, which is a government monopoly. Under these circumstances, it is likely that the government will eventually acquire the telephone lines that it does not already possess. Upon the beginning of the European war there was only one long telephone line in China; viz, from Peking to Tientsin. There were a dozen secondary lines, used solely in connection with the railways, and there were local services in Peking, Tientsin, Shanghai and Canton.

Philippine Islands Service

On December 31, 1916, the Bureau of Posts, which controls the telegraph lines of the Philippian archipelago, had approximately 5,385 miles of wire and 1,038 miles of cable in operation, also operated ten wireless stations. The telegraph lines connect practically all the larger centers of population. The various provinces, as a rule, also maintain telephone lines between the provincial capital and the principal towns operated by the provincial governments. Manila has a fairly efficient Bell telephone system, and a few other of the chief commercial towns are similarly supplied.

The wireless stations are located at Cuabo, Cuyo, Davao, Isabela de Basilan, Jolo, Malabang, Margosatubig, Puerta Princesa, San José, and Zamboanga.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

California

THE Pacific Telephone and Telegraph Company has filed with the railroad commission an application for authority to sell to the United States government for $10 a telephone line from El Portal, Mariposa county, to Yosemite village, in the Yosemite National Park, fourteen miles. The company says that the property is now worth $2,100. The United States Government has decided to own and operate all the telephone facilities in Yosemite, and has requested the Pacific company to discontinue its toll station at Yosemite village and Camp Ahwahnee, and to arrange for connecting the government system with the Pacific system at El Portal. As a matter of fact, all of this has already been done.

The H. E. Bigelow Telephone Company has filed with the railroad commission an application for authority to stop giving telephone service in Cascada and Huntington Lake, Fresno county. The Bigelow company built the telephone line from Auberry to Cascada and Huntington Lake over the tracks of the San Joaquin and Eastern Railroad Company more than two years ago, by an agreement with the railroad. Later the railroad terminated the agreement and deprived the Bigelow concern from using the lines. The telephone company says it would not pay it to build a new line and it wants formal permission to cease service between these points.

District of Columbia

Installation of meters to register telephone calls over measured lines will be considered by the Utilities Commission if that body should grant the request of the Chesapeake and Potomac Telephone Company to do away with unlimited service in Washington.

The proposition is likely to have support in the commission before the hearings are ended and decisions rendered, in view of the widespread objections of the public to features of the telephone company's pleas.

The plan would not call for the compulsory installation of meters at the expense of the company but subscribers desiring these little automatic protectors against overcharges would have the right to require the company to install them at a minimum rate of yearly expense.

Washington people who have tried limited telephone service in the past complain that their telephone bills were practically as heavy under this system as under the unlimited plan, no matter how hard they tried to lessen the number of calls. They claim that a telephone operator, under strain at all times in handling the rush of work, cannot exercise the care necessary in registering calls, and consequently takes the safest possible method by making sure that she has left no call unregistered.

Nearly two years ago this question of private meters was before the utilities commission, but no action was then taken. The telephone company claimed that installation of meters slows the service considerably and causes an increase of 10 per cent in the number of operators.

It was maintained that the company's apparatus for registration is of the latest patterns, being controlled by a centrally located meter system under the constant supervision of skilled operating and maintenance forces.

The private meter costs the company about $14.25 to install, it is claimed, and for private branch exchanges considerably more. On putting in a call the subscriber waits for the connection and word from the operator to push the button for the call. The subscriber does the pushing and not the operator.

In Baltimore, where there are many of these little instruments, the telephone company is allowed to make an additional charge of $3 per year. In Massachusetts, where there are thousands of them, the additional charge is $1.50 per year.

Some time ago a telephone subscriber in this city refused to pay a measured telephone charge on the ground that the number of actual calls had been much less than charged. A suit in the district courts resulted. There it was established, according to public utility records, that a telephone operator became irritated because of something said to her over the phone and punched the registration button about twenty times instead of once. It had to be admitted that this was a possibility under some circumstances. The subscriber won his suit.

Georgia

The application of the Southern Bell Telephone Company to restrict use of its telephones to subscribers, which was postponed at the last meeting until February, on request of the Augusta *Chronicle*, has been docketed for hearing on February 8. In this case there are several protestants.

The telephone company seeks by the enforcement of the rule to cut out thousands of calls that could be dispensed with, and to stop a large number of useless calls and conversations. The company also claims that equipment cannot be secured with which to care for the increasing amount of business, and that the people will have to aid the company by reducing demands upon the service.

Since it was filed protests have been made from all parts of the state. Among those received were a protest from R. C. Turner, city electrician of Atlanta; the Columbus chamber of commerce; the Valdosta chamber of commerce; and the Augusta *Chronicle*.

In addition to asking a postponement, the *Chronicle's* petition protested against the curtailment of service on the following grounds: that the telephone company should be required to file with its petition a statement of its operation expenses and earnings; that the company's charges now are excessive; that the company is unable to render proper service without curtailing the use of telephones, because it pays its employes inadequate wages; that the company, being a public service corporation, should be required to render a certain amount of free service anyway; that the company's petition is based solely on a desire to increase a revenue already too great.

Mr. Turner's petition requests that a hearing on the telephone case be postponed until after the war. If this postponement cannot be granted, Mr. Turner asks that his petition be considered as a plea for a general reduction of telephone rates in Atlanta.

He declares that the rates now are entirely too high and the service very poor.

"Some of the practice and charges of the company are equivalent to highway robbery almost," he asserts.

"If the company is unable to secure the operators, the remedy lies in changing the exchange over to automatic operating equipment which eliminates the human factor in telephone service almost entirely. Buffalo, St. Paul, Minneapolis and Indianapolis have changed over to the automatic within the past year, and the Bell company will eventually have to do the same."

Indiana

Plans for withdrawal of the Bell Telephone Company from Fort Wayne in favor of the Home Telephone and Telegraph Company are announced following the filing of briefs with the Indiana public utilities commission asking that approval of the deal be granted. As a part of the transaction the Home company's interests at Kendallville and Auburn will be transferred to the Bell system. This will relieve the three cities of dual telephone service.

Officials of the telephone companies have been working on the merger for several weeks, but on account of it being necessary to file briefs with the utilities commission no announcement was made following the reaching of an agreement on terms.

Public hearings will be held in Fort Wayne by the commission in order to give the telephone companies and the public a chance to make their statements, but no opposition to the move is expected, as it will be an improvement over the present situation, which necessitates business houses having two telephones in order to reach points outside of Indiana, Ohio and Michigan. With the new plan it will be possible to talk to all cities in the United States from any telephone.

Frank E. Bohn, secretary and assistant manager of the Home company, stated that the deal had been completed for several weeks and will result in a greatly improved service for the Fort Wayne people. It will not, however, bring profit to the Home company, he said.

It is planned to dismantle the present Bell plant at Court and Berry streets as soon as the approval of the utilities commission is granted. The Central Union and American Telephone & Telegraph Company's wires will be connected with the switchboard at the Home plant and it would require only a few days' time to make this change, thus eliminating one system. Action of the utilities commission is expected within the next thirty or sixty days and this is all that is necessary to complete the transaction.

At a recent meeting of the directors of the Home company plans were started for the erection of an addition to the present building at Main and Clinton streets and this will probably be rushed when the unification of the system is completed.

The Waldron telephone plant, Henry C. Doles, owner, has filed a petition for an increase of rates before the Public Service Commission of Indiana. Mr. Doles, sole owner of the plant, is operating it under a flat rate of $1 per month per telephone, business or residence, as fixed by law, this schedule of rates and charges having been in effect since January 1, 1913, and he is now asking that a new schedule be fixed by order of the commission so that he can charge as high as $1.75 per month for independent business telephones and from $1.25 to $1.50 for other telephones.

The petition recites "That petitioner applies to this commission for authority to increase its rates for the reason that in his judgment it is necessary that the revenue of the company be increased in order that it may meet the increased expenses, including the rate of wages of employes and the advanced price of materials and of the up-keep and depreciation, and allow a proper income."

Application is made for authority to increase the rates and put in effect the following schedule:

Independent line business in Waldron, $1.90 per month; 15 cents rebate per month if paid monthly or quarterly; $1.75 net per month.

Independent line residence in Waldron, $1.40 per month; 15 cents rebate per month if paid monthly or quarterly; $1.25 net per month.

Four-party line business in Waldron, $1.65 per month; 15 cents rebate per month if paid monthly or quarterly; $1.50 net per month.

Party line residence in Waldron, $1.40 per month; 15 cents rebate per month if paid monthly or quarterly; $1.25 net per month.

Rural party lines, business, Waldron, $1.65 per month; 15 cents rebate per month if paid monthly or quarterly; $1.50 net per month.

Rural party lines, farm residence, Waldron, $1.40 per month; 15 cents rebate per month if paid monthly or quarterly; $1.25 net per month.

Extension bells payable yearly in advance, $1.75.

Change of location from one part of residence to another, rural, $1.

It is also asked that a deposit equal to three months rental be required for all new subscribers, the same to apply on the first three months' rent.

The business men and all other residents of Waldron and community have organized for the purpose of resisting the petition, and they will have a committee and legal talent on hand to fight the petition the day it is taken up by the state commission. In organizing for the fight Edward Howard was named as president, Melvin Beagle as secretary and O. S. Clay as treasurer, and these men will take the lead in making the arrangements for resisting the granting of the petition.

Illinois

A new emergency war policy was put into effect when the state public utility commission granted the Mount Carmel Utilities Company the right temporarily to increase its rates 15 per cent. The increased rates will be effective until the state commission can investigate the reasonableness of the new rate asked.

The new policy of permitting rate increases in certain cases before a hearing is had is designed to protect utilities that are hard hit through the stress of war and that shall show themselves in dire need of relief.

In every instance where it is applied, however, the company must provide for reparation to consumers in event the commission later decides against the increase.

The commission dismissed the complaint of the Rockford Chamber of Commerce against the receivers of the Central Union Telephone Company relating to toll charges between Rockford and Camp Grant.

The Galesburg Telephone Company has filed a petition asking for leave to issue bonds for $35,000.

The Boone County Telephone Company filed complaint with the State Public Utilities Commission of refusal of the Belvidere Telephone Company to furnish interchange of service with the complaining company between Caledonia and Belvidere.

Michigan

The Tuscola County Farmers Telephone Company at Millington will ask the state railroad commission for permission to increase its rental rates on all telephones $2 a year because of advancing costs.

Missouri

Application of the Southwestern Bell Telephone Company for permisson to increase its telephone rates in Kirksville, Mo., is now before the Missouri Public Service Commission.

The company seeks to increase the price of business telephones from $2 to $3 a month and residence from $1.50 to $1.75, with extensions to business telephones raised from 25 cents to $1 and in residences raised from 25 cents to 50 cents.

The company has applied to the Public Service Commission for permission to increase rates in Marshall also. The application was filed last November and the hearing, after several postponements, has been finally set for February 17.

The Liberty Telephone Company filed an application with the State Public Service Commission for authority to purchase the Clay County Telephone Company and the Liberty exchange for $23,521; also for permission for John A. Eby to purchase the Missouri City exchange for $1,800.

North Carolina

The corporation commission granted authority to the Piedmont Telephone and Telegraph Company to increase the telephone service charges for the town of Shelby on the basis of an increase from $2 to $2.50 per month for single line business telephone service and $1 to $1.50 per month for residence single line telephones. The petition was not opposed by the citizens of the town and there has been no advance in the charges since the exchange and only 119 telephone stations, there being now 551 telephone stations served by Shelby exchange.

Ohio

It may be cheaper to talk over the telephone from Troy to Piqua than to talk from Piqua to Troy if the Public Utilities Commission approves a new schedule which the Central Union Telephone Company of Piqua is said to be preparing and is about to file with it.

One provision, it is said, of this new schedule is that the toll rate from Piqua to Troy shall be uniform to subscribers and non-subscribers. Heretofore the charge has been 5 cents to subscribers and 10 cents to non-subscribers. Under the new schedule the rate will be uniformly 10 cents.

The same discriminating schedule of rates is in force in Troy, but it is likely that should the commission approve the change of the Piqua company the Troy Telephone Company will ask to have its rate schedules amended to conform with the Piqua charge.

There have been intimations several times the last year or two that the rate would be made a uniform one of 10 cents, as the Piqua-Troy rate is the only 5-cent rate in force for a similar distance. It is said to have arisen from the fact that up until some eight or nine years ago this service was free to subscribers, and it was felt the raise to 10 cents would be considered too big a jump.

Pennsylvania

Increased annual telephone rates for certain places throughout the state are provided for in the supplement to its tariff rates filed by the Consolidated Telephone Company with the Public Service Commission. On direct line service the company desires new rates in Allentown, Carbondale, Freeland, Hazleton, Jermyn, Scranton, Dunmore, Green Ridge and Wilkes-Barre. On two-party lines new rates are asked for service in Allentown and Wilkes-Barre. On four-party lines new rates are requested for Peckville, Riverside, Jessup, Winton and Eynon. On multi-party lines increases are requested for Archbald, Jessup, Eynon and Winton.

Oregon

The Lakeview-Pine Creek Electric Company on August 7, 1917, placed before the commission an application for increase in its exchange rates for telephone subscribers in Lakeview, setting forth that the applicant is a corporation of the state of Oregon, that its principal place of business is at Lakeview, Oregon, and that it is a public utility engaged in the ownership, management, operation and control of a telephone system for the conveyance of telegraph and telephone messages and that as such public utility it is subject to the jurisdiction of the Public Service Commission of Oregon and the provisions of Chapter 279 of the General Laws of Oregon for the year 1911.

On the first day of January, 1911, the applicant had in effect the following rates, tolls and charges for 16-hour daily exchange service:

Residence service—	Two-party line	$2.00 per month
	Four-party line	1.50 per month
Business service—	Main line	3.00 per month
	Two-party line	2.50 per month
Interior extension		.75 per month
Exterior extension		1.00 per month

Applicant alleges that on account of existing conditions it is necessary to provide 24-hour service and that to do so will entail extra expense in maintaining a night operator. To meet this additional expense the company proposes to advance its rates to the following:

Residence service—	Two-party line	$2.25 per month
	Four-party line	1.75 per month
Business service—	Main line	3.25 per month
	Two-party line	2.75 per month
Interior extension		.75 per month
Exterior extension		1.00 per month

Pursuant to notice hearing in the above matter was held at Lakeview on October 26, 1917.

Upon consideration of the finding and the full record before it, the commission orders that the application of the Lakeview-Pine Creek Electric Company for an increase in its rates to provide for the establishment of night service be denied.

It is further ordered that the applicant continue its present rates and provide for its subscribers 24-hour service without interruptions; and that the applicant observe the requirements of the Order No. 16 of the Industrial Welfare Commission in regard to its minimum payment for experienced operators.

It is further ordered that the applicant set aside in a depreciation reserve account the annual allowance hereinbefore found reasonable for that purpose and that all moneys available for that reserve shall be placed in a reserve fund and expended only in such manner as it is provided by law and according to plans which shall be submitted to the commission for its approval.

On April 6, 1917, the Southern Curry Telephone Company filed with the commission a request for authority to revise certain of its rates for long distance telephone conversations over its lines, to establish additional toll rates for new stations, rates for exchange switching service to rural co-operative farmer lines wishing connections with the lines of the applicant, and rates for extension sets to be used in connection with original installations. The applicant also petitioned to be relieved from liability to furnish free exchange of service between its subscribers and those of the Chetco Southern Telephone Company, whose lines connect with the applicant's system at Harbor and extend south thereof into Northern California.

As the basis of its application Southern Curry Telephone Company alleged conditions materially as follows:

Its present toll rates are inconsistent and unjustly discriminatory.

Its present rates do not cover certain classes of service, which it desires to give.

On account of the growth and extension of its lines and those of the Chetco Southern Telephone Company, the provision of free exchange service as above indicated places an undue burden upon its lines and makes impossible the continued maintenance of service thereover at a standard of efficiency properly required for its subscribers and the public in general.

Public hearing was held at the City Hall in Bandon on September 13, 1917.

It is ordered that the applicant be given authority to discontinue its present rates insofar as they differ from those hereinbefore found reasonable and that in lieu thereof shall be established the rates and charges so found to be just, reasonable and not unjustly discriminatory.

It is further ordered that the applicant be given authority to discontinue its present practice of allowing free and unlimited exchange of service between subscribers upon its lines and those upon the lines of the Chetco Southern Telephone Company.

Minnesota

The application of the Greenfield Farmers Telephone Company for a physical connection between its local exchange and the toll lines of the Tri-State Telephone & Telegraph Company at Wabasha, Minnesota, was duly heard pursuant to notice at Wabasha, Minnesota, on May 14, 1917.

The Greenfield Farmers Telephone Company is a corporation operating a local telephone exchange at Kellogg, Minnesota, serving approximately 220 local and rural subscribers, a local exchange at Wabasha, serving 123 subscribers, of which 32 are business, 13 residence and 78 rural; also a rural switching station at Theilman.

The Tri-State Telephone & Telegraph Company is a corporation operating an extensive system of local exchanges and toll lines in Minnesota and other states, one of its toll lines being connected with the petitioner's exchange switchboard at Kellogg and also with the exchange of the Dwelle Telephone Company at Wabasha.

The Dwelle Telephone Company is a corporation operating local exchanges at Lake City and Wabasha, with rural lines tributary thereto. At Wabasha it serves 77 business, 263 residence and 96 rural subscribers, also serving stations at Kellogg and Theilman.

The petitioner seeks a physical connection between its local exchange at Wabasha and the toll lines of the Tri-State Telephone & Telegraph Company.

Upon review of the evidence, the commission is of the opinion that the Kellogg and Wabasha exchanges operated by the Greenfield Farmers Telephone Company constitutes one exchange area and that since there already exists a physical connection between the toll line of the Tri-State Company and the exchange at Kellogg, that this petition in effect is an application for an additional physical connection with an exchange which already has a connection with the toll lines of the respondent company. Under the circumstances, and in view of the evidence, such second connection is not warranted.

The evidence conclusively shows that much of the inconvenience and difficulties in the toll service of the subscribers of the petitioner at Wabasha and vicinity are due entirely to neglect and failure on the part of the Greenfield Farmers Company to keep its own equipment in a proper state of repair and to enforce proper operating rules among its own operators such that immediate response would be given by the operators at Kellogg when called by the operators at Wabasha. Also that the poor service which obtains is largely due to the fact that the trunk line of the petitioner parallels a high tension power line and is not kept in a proper state of repair or properly transposed so as to eliminate the electrical induction from the power line. No conditions exist by way of electrical disturbances or otherwise which cannot be remedied by the petitioner if it so desires, particularly since the toll lines of the respondent along the same route between Wabasha and Kellogg are rendering good service. This trunk circuit should be placed in proper condition so as to eliminate the inductive disturbances resulting from its proximity to the power lines, not only to improve the toll service over it, but also to furnish the subscribers of the company with a quality of local service which they are entitled to.

The added convenience to the subscribers of the Greenwood Farmers Telephone Company connected to the Wabasha switchboard by placing a trunk circuit so as to connect the switchboard of the petitioner with the switchboard of the Dwelle Telephone Company for toll service is not material as compared with toll service which may be received over the Wabasha-Kellogg trunk in good condition and properly maintained since a second operator is required in establishing connections with the toll lines. The commission is of the opinion that the petition should be denied, and it is therefore so ordered.

The People's Telephone Company has filed an application with the commission for authority to increase its rates for business, residence and rural telephone service, within the villages of Spring Valley, Racine, Stewartville, Chatfield and St. Charles, the proposed rates being as follows:

Individual line business, per month	$2.50 gross
Two-party business, per month	2.25 gross
Individual line residence, per month	1.50 gross
Four-party residence, per month	1.25 gross
Lodges and clubs, per month	1.50 gross

A discount of 25 cents per month will be allowed if paid on or before the 15th day of the current month.

Multi-party rural, per month ..... $1.50 gross

A discount of 25 cents per month will be allowed if paid quarterly in advance before the middle of the quarter.

It is ordered that the said matter be heard at the Amuzu Theater, in the village of Spring Valley, Minnesota, at 10:00 a. m., February 8, 1918.

Critic Has Service Restored

An argument between a newspaper man and the manager of a public utility resulted in the issuance of an injunction by Master in Chancery Terry of the Macoupin County Circuit Court at Carlinville, Ill., restraining the Gillespie Telephone Company from disconnecting the telephone service to the office of the Gillespie *News*.

The contention grew out of an impression on the part of citizens that a fire had started, due to repeated blasts from a mine whistle. Hundreds of persons tried to get information from "central" at the same time and the girls were swamped.

The *News* commented on it and the company demanded an apology. When one was not forthcoming it served notice that the service would be discontinued, and S. P. Preston, the editor, appealed to the court.

After taking the matter up with Judge Burton, who was confined to his home by sickness, Manager G. W. Pringle of the telephone company notified Editor Preston that his service would be restored at once.

Efficiency Applied to Service

A. H. Stienecker, manager of the New Knoxville (Ohio) Telephone Company, announces that the company is adopting methods to prevent subscribers monopolizing lines by carrying on inconsequental conversations, to the detriment of those who seek to use the lines for the transaction of business.

Manager Stienecker states that some subscribers were in the habit of holding a line for fifteen to twenty minutes, and sometimes longer, for conversation that was entirely unnecessary, and that "visiting by telephone" and carrying on gossip attained such proportions that it was necessary for the company to take some action. Subscribers on the New Knoxville line have been notified that such practices cannot be continued, as it interferes with business, and business must go on in these strenuous times.

The company is also watching for eavesdroppers on party lines, and after they have been given warning about "listening in," and persist in the practice, their telephone will be removed. One family has already lost its telephone on this account.

Manager Stienecker is of the opinion that all telephone companies should adopt similar rules.

A Kansas City attorney has sued a telephone company for $10,300 damages on the ground that "central" made his clients wait frequently and then gave them the wrong number. Attorneys are usually optimistic about the outcome of their damage suits for their clients, but do not frequently take their own prescription.

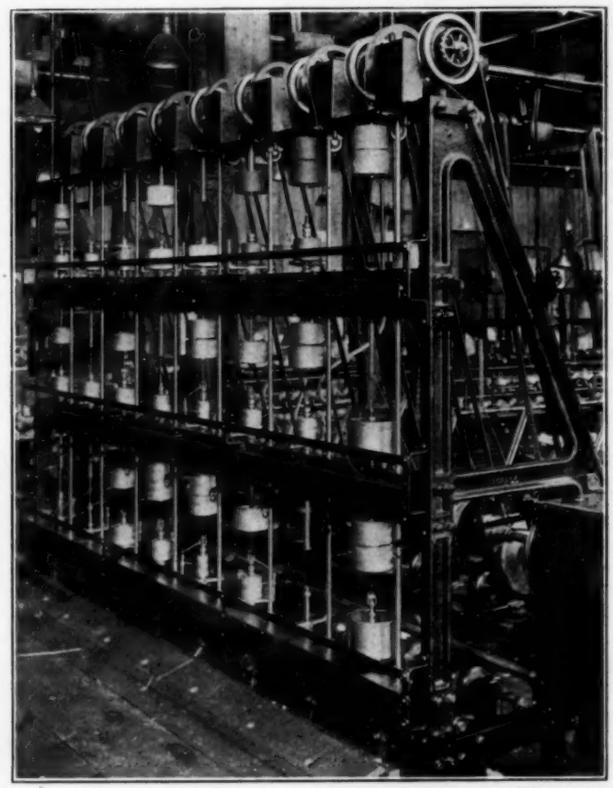
In the last twelve months, the number of shareholders of the American Telephone & Telegraph Company has increased from 70,000 to 87,000.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Switchboard Wire Insulating Machine

In order to produce insulated switchboard wire of a superior quality and to meet an increasing demand for output, the Stromberg-Carlson Telephone Manufacturing Company has installed three vertical type insulating



Modern Switchboard-Wire Insulating Machine.

machines, one of which is shown in the accompanying illustration.

In general, each machine consists of eight independently controlled triple head insulators, mounted on each of the lower middle and upper decks. Each deck is supported by cast iron brackets. "Flyers," as the revolving thread carriers are termed, are run at a speed of 2,650 r.p.m. and are gear-driven from the vertical shafts shown at the right of each set. These shafts in turn drive the capstans located at the top and from here, by means of a belt, the counter shafts for driving the friction for the insulated wire reels, the shafts being controlled by friction clutches shown at the level of the operaing platform.

Each machine is run by a three horsepower 1,050 r.p.m. direct current motor, belt connected to the main drive shaft at the left. This main shaft in turn transmits the power to the head by a geared counter-shaft. This main shaft extends through to a cam at the right, which controls the guides for feeding the insulated wire on the reels.

Reels of bare tinned copper wire are located on the floor and directly above them are the reels to receive the covered wire. The soft drawn tinned copper wire of the desired size is fed through the successive heads from the bottom at a speed which is controlled by the capstan a the top of the machine, thence down to the cable machine reels.

The wire in passing through the flyers or insulating head on the lower deck receives a layer of silk, then through the middle flyer, where it receives a second layer of silk applied in the opposite direction and finally through the top flyer where it receives a serving of cotton applied in the same direction as the first layer of silk.

To reduce the cutting and waste of wire to a minimum a magazine, which has a capacity for two extra spools of silk or cotton, is located over each head, making a maximum run for insulated wire, limited by the amount of material of three spools. In case where material gives out and is not noticed by the operator, wire can be pulled back by running the capstan idle controlled by the handwheel shown at the top.

After cable reels are filled with insulated wire they are tested and are then ready for the cable machine where the wire is laid up and twisted into cable form.

A Practical Cordless P. B. X.

Ease of operation, simplicity, reliable ringing and switching are the outstanding features of the Kellogg cordless P. B. X. turret. It can be installed on any table or desk, which will allow more foot room. Even at a few feet away it is practically noiseless in operation, and is of standard parts throughout.

The Kellogg standard desk set is found of great convenience by practical operators and can be used in the regular way, or attached to a Sperry bracket stand, as shown in the accompanying illustration.

It is a compact little cabinet and can be installed with the greatest ease; can be used on any kind of table, shelf or desk, and has a capacity for ten stations. It can be placed in any part of the room without interfering with the furniture.

The Kellogg company has a detailed illustrated chapter in Bulletin No. 86, which tells all about this cordless

The Kellogg Cordless Private Branch Exchange.

private branch exchange board. The cabinet is constructed of quartered oak, and is very durable.

One of these little switchboards, which has been used as a feature of the Kellogg exhibit at many conventions, holds up continuously under this most trying service.

White Cedar Poles

The production, sale, preparation, and delivery of cedar poles for telephone line construction is an industry of considerable moment—requires a great amount of invested capital, both in timber lands and equipment and a large organization of experienced and capable men.

Cedar pole production is confined to the very short winter season. After the construction of camps and cutting of roads in early fall all hands must make a determined effort to cut. The cutting season is comparatively short—time must be had to trim and skid the timber to the logging roads, where it is peeled free from all bark and sawn to the proper length. With the first good snow the hauling starts and the timber landed at railroad spur.

The telephone company, unlike the sawmill, railroad, paper mills, and other consumers of forest products cannot anticipate their yearly requirements and purchase in the spring of the year for immediate shipment from the woods landings. Requirements will vary for assortment. Green fresh cut or partly seasoned poles will shrink in size, will not last as long and are more expensive to handle than the seasoned timber. The pole consumer wants his deliveries prompt and is deeply interested in knowing that when they arrive he will find them uniform in size and quality—each pole suitable for the work intended.

There is only one solution to this all important problem—the permanent concentration yard.

As the poles arrive from the woods each pole is carefully measured, graded and sorted to pile ready for shipment. Because of the short producing season the woodsman will most naturally commit errors, not only in the selection of timber but also in cutting and grading. Congestions, car shortage, inclement weather, lack of labor and other causes which frequently interfere with shipments from the woods do not affect the movement from these concentration yards.

Shipments to the trade are entirely independent of production and inherent delays. The shipping crew are always on hand with only one goal to attain—"satisfy the trade." When loading on orders each pole is again measured and branded at the butt—the inspector is familiar with the high Kellogg standard of quality and is frequently cautioned to remember the rule, "If in doubt about a pole, do not ship it."

Poles as well as supplies and telephone equipment are shipped promptly by the Kellogg Switchboard & Supply Company.

For example: An order was receiped from the Minneola Telephone Company of Minneola, Kans., dated October 25, 1917, calling for a carload of poles, ranging in size from 4 inch 20 foot to 8 inch 40 foot, all to receiye the hot preservative treatment.

The entire lot was shipped from Minneapolis, October 31, 1917, and arrived at Minneola, November 20, 1917, being only twenty-five days from the date of the order to the delivery of the poles.

The Kellogg Switchboard & Supply Company is doing its utmost to get all goods at their destination as promptly as possible under present conditions.

Donates Building to Red Cross

The Wisconsin Telephone Company has donated the whole of its building at Main and Seventh streets, Racine, during the period of the war, for the surgical dressing department of the Red Cross. Only the lower floor of the structure will be available until next April.

A Highly Efficient Small Mixer

In the Oshkosh Low Loading Mixer, the manufacturers have what they believe to be the most efficient concrete mixer on the market. This machine has many points of quality and advantage which will be keenly appreciated by every company interested in mixing machinery.

The first requisite of a good mixer is that it must produce a perfectly mixed batch of concrete in a minimum length of time. In this first essential the Oshkosh Low Loading Mixer lives up to the reputation of Oshkosh machinery. The four motion mixing produces a thoroughly agitated batch every two minutes. Considering the fact that the capacity is 5 cubic feet of wet mix, this is a remarkable performance.

When the dry material is dumped into the drum it is thrown in among the paddles. As the drum revolves, the paddles turn it over into the buckets which carry it up and drop it on to the inner end of the discharge chute. This throws the mix back into the paddles again and the operation is repeated. Thus the batch is split up and turned over four different ways all at once.

The steel blades or paddles are very heavy and are raised from the drum to allow the water to run under; thus wetting the whole batch quickly and keeping the drum washed clean. This "four-motion" mix is very rapid, very smooth and very thorough.

Another big feature of the Oshkosh Low Loading Mixer is its easy loading and discharging facilities. All material is run up a slight incline to the loading platform and loaded into the hopper direct from a wheelbarrow. This hopper is made of heavy steel plate and is 40 inches wide—ample capacity for taking large loads. It has a steep pitch so that the material runs into the drum without shoveling or pushing. The discharge chute is at a convenient height to load directly into a wheelbarrow without splashing. These loading and discharging features speed up the work and keep the men busy constantly, so that there is no lost time waiting for the batch to mix or in shoveling.

The discharge side of the drum is fitted with a semi-steel guard plate to prevent slopping and to keep the mixer clean. Other points of exceptional merit are the trouble-proof free running clutch, the steel bushed roller chain which reduces friction, and the chilled, accurately machined trunion rollers. The mixer is also equipped, when desired, with a power driven hoist for elevating concrete in building silos, etc. The power used for the mixer is the well-known Novo gas engine. This engine is simple, easily controlled, very economical in fuel consumption, needs little attention and has ample power.

Because of the high speed mixing the Oshkosh Low Loader can be mixing almost continuously. With a small crew it will deliver day after day more concrete than many machines with greater ratings and more help.

Some contractors are buying two or three of them instead of one large machine. There are many jobs where they can do this to good advantage and get the work done in a shorter time with larger profits. The Oshkosh is a money saver and a money maker for every man who uses a concrete mixer. Complete specifications and price can be obtained by writing the Oshkosh Manufacturing Company, Oshkosh, Wis.

The Cincinati and Suburban Bell Telephone Company contemplates increase of its capital stock from $12,000,000 to $16,000,000, but no stock will be issued at present. Stockholders will be asked to ratify the plan at the annual meeting February 20.

Save Your Tracing Cloth

American manufacturers, architects, and all draftsmen are called upon to render an important service to their country. When the workman has finished with the piece of cotton or linen cloth used in his trade, it is flung aside to be destroyed. The Red Cross is asking now for that discarded material. All over the country thousands of women are earnestly engaged in the manufacture of surgical dressings to be used in the hospitals for our wounded soldiers and sailors. The problem of getting enough white goods for this work is enormous. As long as the war goes on the work must go on if we are to live up to the humanitarian ideals typified to the world today by the Red Cross.

Two kinds of cloth are available—draftsman's tracing cloth and old linen and cotton articles to be donated from private households, and, often in large quantities, from hotels. These can be easily collected and handled by the modern laundries, which have now been called upon to perform this work for the Red Cross. With their facilities for collecting, washing, sterilizing and delivering to the local chapters, the laundries are in a position to perform an invaluable service and the least that other trades can do is to help them in every way. If any manufacturer, architect, or draftsman will go to the slight trouble of calling up either the local Laundryowners' Association or one of the large laundries of his city, he will find them only too glad to send for such cloth as he can give them.

These materials the laundry will handle with the greatest possible care, because, as the *National Laundry Jaurnal* says: "Remember it is a matter of life and death —first that you do this work, and second that you do it right."

Taking up the task, therefore, in such a spirit, the *Journal* goes on to give the practical details for treating this draftsman's cloth:

"Some of the tracing cloth is thin linen fabric and some is thin cotton, but whether it is linen or cotton makes no difference in the washing process. The cloth has been treated with a gelatinous dressing, to make the material take ink, and at the same time be transparent. The dressing seems to resemble starch that has been ironed in the goods, in that it is softened by water but does not completely dissolve and come out and leave no trace of stiffness in the goods. As the goods are to be used as surgical dressings, it is desirable that no starch remain and that the goods be as soft as possible. This end is best attained by the use of malt extract, or diastase, which is an inexpensive starch solvent. A short breakdown of malt extract, which is familiar under manufactures' trade names, at a low temperature, will remove most of the drawing ink and at the same time take out all of the dressing that is in the tracing cloth. Those who have not the malt extract at hand will be able to do this work by use of a cold rinse, followed by a hot suds, but the goods will not be as soft as when the malt extract is used. The goods should be given a fairly strong bleach, followed by a sour, to remove the trace of bleach that may remain. Then there should be a good rinse to remove every trace of the sour. The bleach will completely sterilize the goods; hence a boil is not necessary.

"The goods should be extracted as usual, after which the material should be put through the drying tumbler, if one is available, as then the pieces will be soft and pliable. If a drying tumbler is not available, the pieces may be put through the flat work ironer. If it should happen that some drawing ink remains on a piece, it should be put aside and laundered again with another lot of white goods. Tests have indicated, however, that ink comes out almost entirely with the wash and the bleach."

The greatness of the demand for old linen and cotton cloth is being measured up to by the willingness of the laundries to take over this work. Be sure, then, to notify them if you have any of this much needed material. Your promptness to respond to this call may, in sober earnest, become a matter of life or death to some of our wounded men across the sea.

Copper and the World War

America is the greatest copper producing country in the world and its miners are the best paid miners in the world. It is true the miners frequently have demanded higher pay, as the cost of living has mounted. It is equally true that they occasionally have been disappointed in not getting what they asked. But when they pause to reflect on what their conditions would be under German domination they find reason to congratulate themselves.

The wages of a miner in the United States are from 200 to 300 per cent higher than those of men similarly employed in Europe before the outbreak of the world war. Silesian and Austrian miners lived under the most distressing economic conditions, and an American miner's pay would have meant affluence to them.

When the kaiser plunged into war he hurled his armies into Belgium and northern France. With what idea? To seize the coal and iron mines of those two countries. And his armies have held possession of them to this day, with the exception of one or two isolated mines near Lens, which they flooded upon being forced to retire under the repeated onslaughts of the allied armies.

Serbia was crushed in order that the copper mines in that country might come under the control of the German and Austrian governments. Germany had, before the start of the war, developed a tremendous industrial life in the metal trades, and now it is intent upon dominating the world in this field.

Just now the copper industry here in the United States is experiencing an undreamed of prosperity. According to figures of the United States Department of Commerce, recently made public, copper exports to France, Italy and the United Kingdom in September totaled 54,577,594 pounds compared with 52,220,885 pounds for the corresponding month in 1916. Exports of copper to these nations for the nine months ended September 30, 1917, totaled 675,275,340 pounds compared with 458,316,552 pounds in the similar period of 1916.

These figures serve to show what is being done in the copper trade in the United States. The steady work and the good pay of the miners is the result.

"The copper miner or worker in America should realize his enviable position as compared to that of the miner in Europe," said a man high in the copper industry the other day, "and every man engaged in the industry should aid to his full limit our Government in its task of defeating the kaiser's armies and of keeping German rule and German wages on the other side of the water. The miner who doesn't go to the front can do his bit by lending the Government his money to insure continuation of his own favorable conditions."

Ordnance Department Jobs

The Ordnance Department of the army urgently needs several thousand civilian workers, as specified below. The United States Civil Service Commission is conducting an extensive campaign to obtain this needed help.

An inspection of the list of positions will convince anyone as to the importance to a nation at war that it should have the workers now being sought. The actual fighting forces would be powerless without an efficient civilian army behind them.

CLERICAL POSITIONS

2,000 stenographers and typewriters, men and women, $1,100 to $1,200 a year.
2,000 typewriter operators, men and women, $1,100 to $1,200 a year.
2,000 general clerks, men and women, $1,100 a year.
500 index and catalogue clerks, men and women, $1,100 to $1,200 a year.
200 clerks qualified in business administration, $1,200 to $1,500 a year.
300 schedule clerks, men and women, $1,400 to $1,600 a year.
300 production clerks, not more than $1,500 a year.
200 clerks qualified in statistics or accounting, $1,100 to $1,800 a year.
100 statisticians, $1,800 a year.
100 multigraph operators, men and women, $1,000 to $1,200 a year.

TESTING POSITIONS

200 engineers of tests of ordnance material, $1,500 to $2,400 a year.
200 assistant engineers of tests of ordnance material, $1,000 to $1,500 a year.

MECHANICAL TRADES POSITIONS

2,500 machinists, $4.00 a day.
500 machine operators, $2.75 a day.
200 drop forgers, $5.75 a day (piecework).
300 tool makers, $4.50 a day.
Large numbers in practically all other trades.

DRAFTING POSITIONS

500 mechanical draftsmen, $800 to $1,800 a year.
50 gauge designers, $2,000 to $3,000 a year.
100 apprentice draftsmen, $480 a year.

INSPECTION POSITIONS

300 inspectors of small-arms ammunition, $1,500 to $2,400 a year.
100 inspectors of artillery ammunition (high-explosive shell loading), $1,500 to $2,400 a year.
100 inspectors of artillery ammunition (forgings), $1,500 to $2,400 a year.

Shipments of Wire Rope

The attention of the Bureau of Exports has been called to the fact that attempts have been made to export wire rope, classified as galvanized wire, without an export license. The attention of shippers is called to the fact that export licenses are required for all shipments of iron and steel wire rope, cable and strands consisting of six or more wires, whether or not the wires are painted, galvanized or coated in any way, and that it is necessary to obtain an export license for every shipment of this material. It should also be noted that the act of improperly classifying material in order that it may be exported without a license subjects the exporter to the penalty of the law.

The Home and Bell Telephone companies at Kendallville, Ind., will be consolidated. Plans have been completed to effect a merger at an early date.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

E. M. Slemmons, salesman for the Ohio State Telephone Company, living at 60 Cleveland avenue, Columbus, has been advised by the bureau of militia affairs at Washington that he has been appointed to enter the officers' training camp at Camp Hancock, Augusta, Ga. Mr. Slemmons has had 13 years' experience in military activities, having enlisted at the outbreak of the Spanish-American war, in the Fourth Ohio Volunteer regiment. At the close of the war he was elected captain of Co. C, Fourth Ohio, now the 166th U. S. Infantry. He retired by reason of business affairs in 1910. A brother, Lieut. A. O. Slemmons, is now in the service at American Lake, Washington. An uncle, Capt. John P. Slemmons, was one of the organizers of the national guard during the Civil war and was later assistant adjutant general of Ohio.

Rollin T. White of the Michigan State Telephone Company has been appointed a member of the industrial training committee.

J. P. Boylan, former manager of the Ohio State Telephone Company, who left Cleveland four years ago, has been elected president of the Plattsburg, N. Y., Chamber of Commerce. Mr. Boylan is manager of the Mountain Home Telephone Company in Plattsburg.

J. E. Bonell, who has been in charge as manager of the Eau Claire office of the Wisconsin Telephone Company for a period of years, has been appointed to the position of district traffic supervisor in the Eau Claire district, succeeding F. A. Kindt, who has heretofore held the position, and who is about to be transferred to a similar position in the Madison district with headquarters at Madison, Wisconsin.

C. N. Culbertson, who has been in charge of the Plant Department as wire chief for a period of years in the Eau Claire office, has been appointed to the position of manager of the Eau Claire office, succeeding Mr. J. E. Bonell. Mills Middlekauf, assistant wire chief, has been put in charge as acting wire chief.

T. N. Moore, assistant to the commercial superintendent of the Wisconsin Telephone Company, with headquarters in Milwaukee, has been named district manager with headquarters in Madison.

S. L. Hout, for the past fifteen years superintendent of the Middlebury Telephone Company of Indiana, has resigned to accept a position with the Home Telephone Company at Elkhart.

A. Goehring has assumed the management of the Centralia, Washington, exchange of the Pacific Telephone & Telegraph Company, succeeding Frank G. Favorite, who recently resigned and moved to Washington, D. C. Mr. Goehring, who has been a resident of Seattle for the past year, was formerly manager at Lewiston, Ill., for the Central Union Telephone Company.

G. G. Lundberg has resigned as manager of the Helena, Montana, district of the Mountain States Telephone and Telegraph Company, to engage in the lumber business in Oregon with his brother-in-law. R. C. Swain, who has been district cashier, has been promoted to the vacancy. The new cashier has not been announced. J. N. Whittinghill, chief clerk to H. E. McAfee, division general manager, is to become manager of the Billings district, with headquarters in Billings, succeeding J. C. Owen, who becomes manager of the Butte district, Claude G. Cotton having resigned. Mr. Whittinghill's position in Helena will be filled by L. C. Gallagher, assistant chief clerk, and Edward A. Murphy will assume the duties of assistant chief clerk.

L. T. Moore, who has been plant foreman of the Cumberland Telephone and Telegraph Company at Natchez, Mississippi, for the past two years, has been transferred to Vicksburg, where he will work in the same capacity for the Cumberland. Mr. Moore is succeeded by S. S. Black, who has been electrician of the company, and Mr. Black's place has been filled by M. D. Bridges of Jackson.

Dr. A. C. Scott of Dallas has been employed by the Texas Telephone Company at Waco to value the properties of the Waco telephone exchange. An auditor also will be employed in connection with the work, and the reports of the two will be submitted to the Waco City Commission. Dr. Scott recently completed an appraisal of the Bell properties. Several months ago he made a valuation of the Automatic exchange. Dr. Scott is now in Waco directing the work of his experts.

Jack Brown, manager of the California Telephone & Light Company, for Sonoma, has been promoted to the post of superintendent for the corporation made vacant by the resignation of "Bob" Evans, who goes into the army February 1. Lloyd O. Trowbridge, who has been with the company for more than a year past, has been promoted to manager of the Sonoma branch.

J. J. Veatch, district manager of the Paris Home Telephone & Telegraph Company, of Paris, Kentucky, has been installed as a councilman of the city of Paris.

Thomas Phalen has severed his connections with the Northwestern Telephone Exchange Company as district commercial manager, with headquarters in Sioux Falls, S. D., and has taken up his new work as traveling salesman for the Western Drug & Chemical Company, of Waverly, Minn.

J. A. Lakness, manager of the office of the Mountain States Telephone and Telegraph Company at Nampa, Idaho, has been promoted to the cashiership of the Boise district by his company and W. H. Geopfarth, manager of the company's office at Weiser has been selected as the successor of Mr. Lakness. Z. G. Mehse, of Boise, whom Mr. Lakness succeeds as district cashier, has been appointed to a deputyship in the state auditor's office by State Auditor Clarence Van Deusen. Mr. Mehse, who severs his connection with the company as the auditor of this district has been with it for a number of years.

Edmond H. Liles, general manager of the Merchants Telephone Company, Middlesex, N. C., has joined the Aviation Corps of the United States Navy. Although married, Mr. Liles decided it was his duty to serve Uncle Sam, and has resigned to become a flyer.

Major Garrison Babcock, S. C. R., is stationed at the Signal Officers' Training Camp, Fort Leavenworth, Kan. Major Babcock, at the beginning of the war last April, gave up his practice as consulting telephone engineer and volunteered his services. He was commissioned captain and has recently been advanced to the grade of major.

A. G. Valentine, son of J. C. Valentine, who recently passed away in Effingham, Kan., has succeeded his father as manager of the Northeast Kansas Telephone Company, of Effingham. Mr. Valentine was formerly vice-president of the company.

Edward M. Cooke, second vice-president and general manager of the Keystone Telephone System at Philadelphia, has been elected a director of the Keystone Telephone Company.

H. P. Watson, manager of the Anniston, Alabama, exchange of the Southern Bell Telephone and Telegraph Company, has had a continuous service with that company of more than thirty-five years, and there is now only one man connected with the organization who outranks the Anniston manager in point of service. W. T. Gentry, president of the company, has the distinction of having more years of service to his credit than does Mr. Watson, though strictly speaking the president of the company is not entitled to this distinction. He gets credit for several years of service with the Western Union, when in fact Mr. Watson has served more successive years in the harness of the company than the president has. Mr. Watson has been in the service 35 years, while Mr. Gentry's record shows 40 years. Mr. Watson has been in charge of the local exchange for a number of years, and while the recent months have brought many calls which the company has been unable to fill on account of a lack of material, the service given the people of Anniston will compare favorably with anything given in other cities under more favorable conditions.

NEWS FROM THE FIELD.

CALIFORNIA

The Railroad Commission has issued an order authorizing the Pacific Telephone and Telegraph Company to sell to the United States government certain telephone properties in the Yosemite national park for $10. The actual cost of the property is estimated at $21,000, but the government is building its own lines, and desires to control all telephone service in the park. To establish communication between the government service in the park and outside points, it proposed to connect the government lines with those of the Pacific company at El Portal.

At the meeting of the Los Gatos Telephone Company the following directors were elected: J. D. Case, Z. S. Riggs, F. F. Watkins, G. W. Turner, J. W. Davis, J. D. Farwell. The only change in the board is that of Mr. Case taking the place of J. O. Jensen, who has ceased to be a stockholder of the company. The company is in excellent condition and its business is steadily increasing under the efficient management of F. F. Watkins.

The United Telephone Assocaition at its regular annual meeting at the Modesto Irrigation office elected the following officers for the ensuing year: President R. M. Fike, re-elected; vice-president, J. M. Cochrane; secretary-treasurer, O. L. Linn. The United Telephone Association is prepared to continue its activity for formation of a public uitility district as soon as the injunction suit by John Randolph, of the Turlock Telephone Exchange, against the county officials has been decided by Judge William M. Conley of Madera, this case having been tried and submitted on briefs several weeks ago.

ILLINOIS

The Rock River Telephone Company held its annual stockholders' meeting Jan. 8. The officers re-elected were: President, G. W. Hamlin, Rochelle; vice-president, J. W. Hoopes, Chana; secretary-treasurer, A. B. Sheadle, Rochelle. Directors: W. P. Landon, Fred W. Craft, G. W. Hamlin, and A. B. Seadle, of Rochelle; J. W. Hoopes, of Chana; Horatio Wales and Alex Anderson, of Polo; George W. King, of Kings; and C. A. Beebe, of Forreston. A semi-annual 4 per cent dividend, payable February 1st, was declared.

At the annual meeting of the Pearl City Mutual Telephone Company the following officers were elected for the ensuing year: President, R. R. Thompson, clerk and treasurer, Lewis Kuhlemeier. The board of directors will consist of L. C. Housel, R. R. Thompson and Aug. Koeller, who was elected at this meeting. A vote was taken authorizing the directors to confer with the directors of the Pearl City Independent Telephone Company to learn their proposition to buy the Mutual System.

At the annual meeting of the stockholders of the Belvidere Telephone Company all the directors were re-elected, as follows: J. R. Balliet, George H. Grummon, F. S. Rowan, Wm. M. Marean and George T. Keator. The annual reports were read. The directors also met and re-elected the officers, who are: President, J. R. Balliet; vice-president, George T. Keator; secretary, F. S. Rowan; treasurer, Wm. M. Marean.

The Crescent Telephone Company of Hillsdale held its annual election of officers in the Hillsdale hall. Extensive business was transacted at the meeting, and the company planned to make several changes in the by-laws of the organization. It was announced that 1918 shareholders would receive 6 per cent on stock investments, or $1.50 and also 6 per cent on $10 telephone valuations, or 50 cents. The following officers were elected for the year 1918: President, C. C. Walters of Port Byron; vice-president, Leslie Hanna; secretary, A. A. Mathews of Erie; treasurer, Ray C. Palmer of Hillsdale. The following directors were also elected for the year: E. A. Young, Erie; Gus Meeske, Hanson township; Oscar Anderson at large; Kirk Thompson, Erie; J. A. Pace, Newton township; Will James at large; Fred Filmer, Coe township; Wesley Hanna, Canoe Creek township, and George Wainwright of Zuma.

The Geneseo Telephone Company had its annual meeting on January 9. The three directors whose time had expired, J. B. Ensey, James Stevenson and Will Lieberknecht, were re-elected. At the meeting of the directors Mr. Ensey was re-elected manager and treasurer, and Mr. Phineas Morrow, secretary.

An agreement has been reached whereby the Central Illinois Independent Telephone Company will purchase the lines and business of the Wenona Telephone Company. However, the consolidation of the two Wenona exchanges cannot be completed until the deal is ratified by the public utilities commission.

INDIANA

At the annual stockholders meeting of the Home Telephone Company, held at the local office, Judge N. G. Hunter was re-elected president of the board of directors. Because of the serious illness and recent stroke of paralysis suffered by W. S. Stitt, former secretary, he was the only member of the board not re-elected to an office. H. E. Wallace succeeded Mr. Stitt as secretary. Mr. Wallace was former vice-president. John Hipskind will continue as the treasurer. William V. Pressler was elected to the vice-presidency. Henry Webber, of Hill street, is the fifth member of the board as alternate. The reports of both the treasurer and secretary for 1917 were read and approved.

The board of directors of the Dunlap Telephone Company elected the following officers: Jacob Bauer, president; John W. Dunmier, vice-president; L. C. Cripe, treasurer; George W. Rhoades, secretary; Jacob Ware, fifth director.

The Mutual Telephone Company has elected the following officers: President, E. W. Olinghouse; vice-president, Ernest Yoder; secretary and treasurer, A. L. Gerber; trustees, C. Greenawalt and L. W. Meroney.

At the annual meeting of the stockholders of the Farmers' Mutual Telephone Co., held in Millersburg, were elected: President, J. L., Juday; vice-president, William Chiddister; treasurer, S. A. Widner; secretary, D. A. Wortinger. Directors: Jacob Beach, G. C. Zollinger, Ed Bartholomew. The president, vice-president, secretary and treasurer will also act as directors, making seven members in all on the board. The president was also vested with the duties of general manager and all work will come under his supervision.

Stockholders of the Leisure Telephone

Company, at their annual meeting elected Bert Leisure, William Rybolt, Mike Shay, F. M. Scott and G. A. Armstrong as directors. The officers were William Rybolt, president; G. A. Armstrong, secretary; Mike Shay, treasurer. There are now 87 stockholders in the company who have telephones and there are 65 renters. An exchange is maintained at Leisure and outside service is obtained through the C. U. exchange in Elwood.

IOWA

The annual meeting of the Lincoln Telephone Company was held on January 14, at Ridgeway. Among the questions taken up for discussion was the revision of the articles of incorporation. Hereafter there will be five directors in place of twelve, one for each division. The following officers were elected for the ensuing year: President, A. P. Anderson of Sumner; vice-president, E. O. Ellingson; secretary, C. T. Trytten; treasurer, Elmer Ringoen. Directors: Anton Olson, Nels Kolaas, Erick Twedt, A. Kuboushek, Calmar; J. Klimesh, Conover; A. Mzik, George Albertson, Wm. Soukup, N. A. Bergan, J. Jacobson, Ole Rue and H. Opstedahl, of Ridgeway.

The annual meeting of the stockholders of the Eldridge Mutual Telephone Company was held at the bank building at which it was voted to increase the capital stock of the company due to the increased number of subscribers. The present authorized capital is $10,000, and it was decided to make it $25,000. The present board of directors were re-elected as follows: Rudolph Koch, Ferd Baustian, Guss Grell, F. C. Keppy, Henry Fellner, Rudolph Moeller and Theo. Zabel. Officers were elected as follows: President, Rudolph Koch; vice-president, Ferd Baustian; secretary, M. H. Calderwood; treasurer, A. C. Oetzmann.

The Red Oak Mutual Telephone Company held their annual meeting at Red Oak and elected the board of directors. Those chosen were Geo. Bishop, Horace Ewing, W. A. Gilmore and F. R. Iddings. The board then met and elected the following officers for the coming year: A. J. Anderson, president; Horace Ewing, vice-president, and F. R. Iddings, secretary and treasurer.

The stockholders of the Mutual Telephone Company of Davis county held their annual meeting and elected the following officers: R. D. Sullivan, president; W. P. Huffman, vice-president; W. H. Wiseman, secretary; C. D. Fortune. The executive board is composed of R. D. Sullivan, G. W. Phillips and S. S. Standley. The directors voted to take up the matter of connecting with the long distance lines and effect a working agreement if possible.

The regular annual meeting of the stockholders of the Woodward Mutual Telephone Company was held in the State Bank building. A goodly number of the stockholders were in attendance. The business done in past year was highly satisfactory and the managers financial report showed the company to be in very good shape. The following officers were elected for the ensuing year: H. R. Naiden, president and secretary; M. W. Siglin, vice-president; H. P. Calonkey, treasurer. Directors: M. W. Burrel, L. E. Williams, Joe E. Storm and J. H. Hurst.

The Farmers' Mutual Telephone Company of Yarmouth held it annual meeting on January 9. The following officers were re-elected: James Enke, president; Frank Mitchell, vice-presidnt; Herman Weinrich, secretary; Charles Brown, treasurer; W. G. Edwards, manager.

The Elliott Mutual Telephone Company held their annual meeting at Woods opera house and transacted the usual amount of business. The president, Mr. W. L. DeWitt, and Vice-President M. M. Roberts were re-elected and Mr. D. C. Reynolds was elected secretary to succeed Mr. H. S. Leonard, who has moved from town.

At a meeting of the stockholders of the Sioux City Telephone Company officers and directors of the company were re-elected as follows: Howard S. Baker, president and general manager; F. L. Eaton, vice-president; W. P. Manley, treasurer; E. A. Burgess, secretary. Directors: Howard S. Baker, F. L. Eaton, D. S. Lewis, W. B. T. Belt, J. P. Martin and E. A. Burgess. The company did not pay a dividend for 1917. Howard S. Baker made a report of the extensions and improvements necessary to meet the growing demands of the city, which consist of about eight miles of trench in which conduit and heavy cables will be laid, and several miles of heavy aerial cable in various parts of the city. In addition to this, two of the sub-exchanges were enlarged and additional equipment was installed in the main exchange. The cost of these improvements will total close to $100,000. The company had a net gain of 185 subscribers during the year, and now has 1,122 phones in operation. The total amount invested in the plant amounts to $1,336,313. Owing to war conditions and the uncertainties of delivery, the company has placed orders for a large portion of the equipment for this year, which will be installed as soon as possible after it arrives.

At the annual meeting of the Clarke County Telephone Company the following officers and directors were elected for the ensuing year: D. M. Gibson, president; W. J. Niblo, vice-president; O. R. Shaw, secretary and manager; F. J. Emary, treasurer. Of the eleven directors the following four, whose terms expire this year, were re-elected: T. J. Emary, J. J. Schaffer, J. H. Piper and A. F. Williams. An auditing committee compr'sed of the following stockholders was appointed: A. F. Williams, F. J. Emary and Johnson Richards.

The annual meeting of the Nordness Telephone Company was held January 8, at which time the following officers were elected: President, O. O. Lomen; manager, J. Brown; auditor, C. J. Thorgrimson. Directors: Thomas Hougen, J. Kallevang, H. Lansing, G. E. Haugen, Edgar Aarnes, George Hamre, A. Horgenson, E. Danielson, J. Humpal, C. Waters, G. Tniderholt, Joe Brockner, S. Tovson, J. E. Bakke and Paul Ode.

KANSAS

The directors for the Clay County Cooperative Telephone Association were elected at the annual meeting of the stockholders. The meeting was addressed by the state president, J. B. Shields, of Lost Springs, Kans. The following were elected directors for one year: W. N. Chapman, R. R. Miller. For two years: A. E. Page, M. M. Smith and J. W. Taylor. For three years: Eric Swenson and J. L. Cultra.

KENTUCKY

Immediately after the purchase of the telephone franchise from the Versailles council by Thomas A. Combs, president of the Fayette Home Telephone Company, officials began preparing estimates on the improvement work which is to be done on the Woodford county telephone system. The intention of the local company is to build a new exchange building at Versailles at an aggregate cost of $15,000. Practically all of the switchboards will be replaced by those of latest design. This work will be done all over Woodford county and the subscribers to the company will have advantage of the same facilities offered those of Fayette county. Officials are now busy with estimates and it is not thought that actual work will begin until March 1. The date of the commencement of work depends entirely upon the ability to get the necessary equipment and supplies. If these are procurable at an earlier date the work will begin immediately upon their arrival.

MICHIGAN

The annual meeting of the Watson Telephone Company was held January 7. All the former officers were re-elected except John Witt, who was chosen a director.

A persistent rumor has it that the telephone companies of Isabella county are soon to be merged. The plan is for the Union Company to take over all the Bell property. This announcement is not in any way official and the local managers of both companies refuse to make any statements concerning the matter.

MINNESOTA

The annual meeting of the Medford Telephone Company was held and the following board of directors was elected: Walter Boynton, S. C. Turner, E. R. Webster, D. A. McKinlay, Vincent Kubicek. Mr. McKinlay was re-elected secretary and treasurer of the board.

At the annual meeting of the Fairfax Telephone Company, the following officers were elected: Wm. Dickmeyer, president; Paul Albrecht, vice-president; A. E. Fenske, manager; F. E. Sander, secretary and treasurer. The Renville Rural Telephone Company, also held their annual meeting electing the following officers for the ensuing year: Paul Albrecht, president; Herman H. Rieke, vice-president; Herman Schmechel, manager; R. H. Greer, secretary and treasurer; F. E. Sander, assistant secretary and treasurer. Both of these companies are endeavoring to give their patrons good service and as a result new customers are being secured regularly; at the annual meetings the usual dividend was declared.

The annual meeting of the stockholders of the Clearwater and Nokay Lake Telephone Company was held at J. H. Dickinson's January 14. Officers elected were president, G. P. Edquist, and secretary-treasurer, Fred Hanson, both re-elections. Lew D. Taylor, local manager of the Northwestern Telephone Exchange Company, was present. It was decided to metalize the telephone line to the city limits. When this is done, it is said, any noise caused by induction will be eliminated, making the line one of the best in the vicinity of Brainerd.

At the annual meeting of the Kanabec County Mutual Telephone Company the following officers were elected: President, A. G. Bentson; vice-president, William Monson; secretary, Frank P. Powers; treasurer, Victor C. Peterson; directors, B. Newgaard, P. O. Nestrom; general line overseer and director, John L. Irene.

The annual meeting of the Redwood County Rural Telephone Company was held

in Redwood Falls. The first feature of the day was an excellent dinner served by the Gallea brothers in the dining room of the armory. This dinner was paid for by the telephone company and has become a feature of the annual meeting. Many of the business men were the guests of the company upon this occasion. Following the dinner a short program of talks was given with A. D. Stewart, president of the company presiding. Those who responded to the toasts were Mayor Wm. M. Smith, A. R. A. Laudon, John Price, J. R. Keefe, Sheriff Hassenstab, J. F. Conner, N. W. Cobleigh and Dr. Sarchet. The annual business meeting was held in the court room and the following officers were elected: President, A. D. Stewart; vice-president, John Price; secretary, A. M. Dennishoun; and treasurer, J. M. Little. The other directors are: D. R. McCorquodale, H. Dreyer, W. W. Carlile, L. Lindeman and And. Olson.

The Bemidji office of the Northwestern Telephone Company has a new manager to succeed "Joe" Cannon. G. H. Bielitz having been transferred from Grand Rapids, Minn., where he was manager of the Bell system for the past three years.

NEBRASKA

At the annual meeting of the Martinsburg Telephone Company, the following officers were elected: Arthur Macy, president; Guy Bombar, treasurer; A. E. Bagey, secretary.

Stockholders and directors of the Independent Telephone Company met and elected the following officers: E. H. Merriam, president; C. G. Saunders, vice-president; C. D. Parmalee, secretary; W. A. Pixley, assistant secretary; T. G. Turner, treasurer; J. W. Christie, assistant treasurer; C. G. Saundes, counsel; W. A. Pixley, auditor. W. B. T. Belt, C. G. Saunders and G. H. Pratt compose the executive committee. Following are the directors: C. G. Saunders, E. H. Merriam, T. G. Turner, W. A. Pixley, W. B. T. Pratt, C. D. Parmalee, C. E. Yost and Frank Elgan.

The Cortland Telephone Company held its annual meeting and elected these officers: President, Ben Jackson; vice-president, Perry Burling; secretary, Frank Miltenberger; manager, David Boesiger; directors, F. H. and Will Page, W. C. Lucke.

At their annual meeting all of the officers of the Farmers' Mutual Telephone Company were re-elected for another year as follows: J. C. Rogers, president; Chas. Bals, vice-president, and Alvin Blessing, secretary. Mr. Rogers and Mr. Pocock were re-elected as directors, their terms expiring at this time. Mrs. Nelson, the efficient manager for a long time, was promptly re-elected by the directors who held a meeting after the stockholders' meeting.

The following officers have been elected by the Farmers' Mutual Telephone Company of Avoca: E. R. Straub, Albert Seimer, Dietrich Koester, W. H. Wright and John Baier.

Consolidation of the two telephone exchanges at Red Cloud, one belonging to the Farmers' Telephone Company and the other to the Lincoln Telephone & Telegraph Company, will be ordered by the state railway commission, as prayed for in two petitions filed by some of the patrons of the two concerns. The terms of the merger will be fixed by the commission after a physical valuation of the properties, the book accounts investigated, and a hearing held at Red Cloud in which each company and the patrons will be given an opportunity to present evidence.

OHIO

The Grand Rapids Mutual Telephone Company met in regular annual session with President L. E. Carson in the chair. The session disclosed the fact that the company had enjoyed the most prosperous year in its history. The following officers were elected by acclamation; L. E. Carson, president; Wm. Dresher, vice-president; O. R. Lawrenz, secretary-treasurer. Directors from the Northside: Andy Long, Harmon Graf, W. Oresher; directors from Southside: E. O. Heyman, J. J. Judson, Frank Baker; director from Grand Rapids, H. R. Gray.

Directors of the Auglaize Telephone Company at Waynesfield were elected and organized as follows: Charles F. Herbst, of Wapakoneta, president; H. L. Howell, of Bellefontaine, vice-president; R. T. Means, Waynesfield, secretary and manager; J. E. Kerr, Lima, treasurer; Frank Day, of Waynesfield. The company intends installing a new switchboard this year, to cost five or six thousand dollars, which will afford the most up-to-date service, and do away with the trouble occasioned by parties "listening in" on party lines.

The plan to increase the capital stock of the Cincinnati and Suburban Telephone Company to the amount of $1,121,700, was received by stockholders. The stockholders are given the right to subscribe for one share of new stock for each eight shares of stock held. With the increase in capital the annual dividend rate on the stock is to be 8 per cent instead of 10 per cent, as at present. The coming April dividend will be at the new rate. The extra dividend amounts to $6.25 a share, payable January 15th.

J. E. Walton, of Salem, Ohio, has been elected president of the Winona Central Telephone Company at the annual meeting of stockholders at the Winona office. Other officers are: Vice-president, Frank Coppock; secretary, J. Jenkins; manager, Dillwyn Stratton; assistant superintendent, Joshua Brantingham. The financial statement given out follows: Receipts—Winona, $3,669; Dungannon, $1,142; Hephner Hollow, $1,439; tolls, 274; miscellaneous receipts, $28; interest on investment, $70; total, $6,625.11. Expenses—Material for maintenance, $1,197; operators at Winona, $767; operators at Dungannon, $502; operators at Lisbon, $447; salaries, $1,670; office rent and fuel, $204; stationery, $33; directors' fee and incidentals, $81; addition and betterment, $647; tax, $313; dividend, $698; cash on hand, $61.85; total, $6,625.11.

The Cleveland Telephone Company has purchased from the Walter H. Telling Realty Company, 93 to 200 feet at Mayfield road and Longwood drive, Cleveland. A frame building is on the property, which is being used as a telephone exchange. Consideration in the deal was about $4,500.

The Kenton Telephone Company has elected: President, W. A. Norton; vice-president, L. A. Ansley; secretary, Charles B. Fink; treasurer, H. J. Miller.

The Lemoyne Telephone Company re-elected the old directors. J. B. Truman was elected to fill the vacancy caused by the death of Mr. King. J. L. Herman was elected president; E. G. Baker, secretary; A. C. Root, treasurer and general manager.

The annual meeting of the stockholders of The Wayne County Telephone Company, was held in their offices with nearly a hundred present. Some proxies were held. The meeting was full of interest. President Garrett, in his report showed a gain of 314 telephones since January, 1915, and cash paid on notes $3,550 in this period. The following directors were elected: J. P. Garrett, G. D. Barnard, D. W. Frase, John Leichty, Philip Tawney, S. G. Spangler, A. W. Metcalf, J. A. Miller, A. L. Thompson and John D. Wagner. Mr. Wagner is a new man on the board. President Garrett received the biggest vote.

The annual meeting of the Weston Home Telephone Company, was held on the 7th of January at the G. A. R. hall. The company has been making some rapid strides and is fast coming to the front. Everything was found in good shape and the prospects for a prosperous year are very promising. The following officers were elected: President, G. W. Potter; treasurer, Lewis Toan. Directors: B. F. Metzger, Omar Swartz, Edw. Guyer, Aaron Businger and A. L. Hull.

The directors of the Hamilton Home Telephone Company, F. M. Hughes, C. Z. Mikesell, C. N. Huston, E. H. Hughes, J. G. Sommers, F. M. Barden, Ben Strauss, C. B. Funk and J. C. Slayback, met for organization. The following officers were chosen: President, F. M. Huhges; vice-president, F. M. Barden; secretary, J. C. Slayback; treasurer, C. N. Huston; general manager, James Walker.

OREGON

At the recent meeting of the Buxton & Banks Telephone Companv subscribers O. G. Garrigus was elected president, John McFarlane, vice-president; S. Paisley, secretary and treasurer, and George Fisher, William McGill and John Friday, directors. An assessment of $1 a share was levied and the president was authorized to employ an expert electrician to put the line in repair.

PENNSYLVANIA

About $5,000 will be spent by the Bell Telephone Company of Pennsylvania, for the rebuilding of the so-called Mahaffey Hastings Toll Line between Mahaffey and Hastings, a distance of twenty-three miles, and the Mahaffey-Arcadia Exchange Line, a distance of fifteen miles, according to Local Manager H. M. Peck, of Cearfield. This work will mean the placing of ten poles, one hundred and twelve crossarms and more than two circuit miles of aerial wire; the replacing of one hundred and thirty-nine poles and about nine circuit miles or aerial wire. "The work will probably be started," said Mr. Peck, "and it will be finished in the early part of the summer."

The stockholders of the Bethel and Mt. Aetna Telephone Company held its annual meeting in the local school house, and elected the following directors: Harry R. Miller, D. W. Ensminger, James Schlaseman, Emanuel Merkey, John Werner, S. W. Deiffenbach, Aaron Walmer, C. P. Kalbach, C. M. Richardson, Tyrus K. Merkey, William H. Bickel, Charles G. Speicher, James M. Kline, Ira Gibble and Isaac B. Krall. Since the company bought the Reistville Telephone Company's line the list includes two directors more than heretofore.

Stockholders of the Middleburg Creek Valley Telephone Company held a meeting in their offices over the National Bank building and elected the following officers and directors: President, Harold McClure; vice-president, James Magee; secretary, George W. Wagenseller; treasurer, John S. Kauffman; general manager, Frank A. Eyer; directors: George W. Wagenseller, John S. Kauffman, James Magee, Professor Thomas Shambach, Thomas Spigelmire and John W. Kassinger.

TEXAS

The telephone exchange in Brownsboro, Henderson county, Texas, has been taken over by J. V. Greer, owner of the Ben Wheeler Telephone Exchange, Ben Wheeler, Texas. Mr. Greer has already begun to make extensive improvements to the system.

VIRGINIA

A corporation to be known as the Whitacre Telephone Company, Inc., was formed at Whitacre recently for the purpose of building a telephone line to Winchester and other points radiating from Whitacre. The capital stock is $3,000. The following are officers: W. C. Whitacre, president; T. A. Scrivener, vice-president; R. E. L. Whitacre, secretary and treasurer, and O. W. Dick, T. A. Whitacre and Sam H. Braithwaite, directors.

WASHINGTON

At a meeting of the stockholders of the Skagit Valley Rural Telephone Company, held in the Commercial club rooms recently, the following were elected to office, to serve for the ensuing year: Harry Neely, president; J. M. Harrison, vice-president; A. Lillimann, treasurer, and E. N. Livermore, secretary. Directors to serve for three years were chosen as follows: G. F. Wersen, of Mount Vernon; E. L. Wilson, of Burlington, and Peter Lee, of Fir. The condition of the Rural Telephone as shown by the reports submitted at this meeting, was shown to be extremely favorable. Many new lines have been extended into Burlington and Sedro-Woolley and to other exchanges established during the last year. There was considerable discussion as to future plans as every man present entered into the discussion. It is the general opinion that the Rural Telephone Company will soon invade Mount Vernon with a campaign for service. It is understood that the city council may again take up the matter of granting a franchise for this purpose. As soon as the spring weather comes on the Rural company plans on beginning its work along these lines, with Mount Vernon as the starting point.

WISCONSIN

The Union Telephone Company held their annual business meeting on January 4. The same directors were elected which were J. Callaway, Wm. Hickey, O. W. Sherman, J. A. Murray, Henry Otto, Walter Hintze, local manager, and Claire Evert, chief operator.

The stockholders of the Inter-Co. Telephone Company met at the court house and elected officers for the coming year as follows: President, F. A. Bauer; vice-president, W. P. Averill; treasurer, C. R. Heike; secretary, Anton Weiss. Directors: Louis Bauer, Mike Brunner, John Brunner, Jr. The president was instructed to see about the matter of a free line to Mondovi.

The Wisconsin Telephone Company on December 31 completed the work of repairing its toll lines in the Appleton district. The lines covered extend north as far as Rhinelander and Marinette, south to Campbellsport, east to Sheboygan and Manitowoc and west to Wautoma and Sheridan. The property covered included 1,340 miles of pole lines and 7,900 miles of wire, and the cost was $44,500.

The annual meeting of the Van Dyne Telephone Company was held at Van Dyne. Officers were elected as follows: President, John Wildenberg; vice-president, Edw. Zentner; secretary, Albert Widmore; treasurer, Charles Finder. Director, Otto Zentner. The company has now 133 telephones in service. Its business is conducted principally in the towns of Nekimi, Eldorado, Friendship, Black Wolf and the village of Van Dyne, where its central office is maintained. The company's equipment is in satisfactory condition and no improvements are now deemed necessary for the coming year.

N. S. Hersey was elected president of the Woodhull Telephone Company at the annual meeting held recently. Lee Treleven was chosen secretary and Frank Barron, treasurer.

J. H. Bierne was elected president of the Oakfield Telephone Company at the annual meeting of the directors held in the parlors of the Oakfield State bank in the village of Oakfield. W. E. Bristol was chosen secretary while J. J. Bierne was elected treasurer. J. H. Bierne, J. J. Bierne and S. E. MacCumber were elected directors at the annual meeting of the stockholders. F. M. Barber, who has acted as manager of the company for the past year, will undoubtedly be relected by the directors. The company enjoyed a very good business during the past year and now has 600 phones installed, an increase of 40 over last year.

The Hillsdale Western Telephone Company held its annual meeting and elected the old officers for another year. They are: Fred Hoxie, president; Jacob Hawkinson, vice-president; Peter Hughes, secretary; A. J. Hover, treasurer, and F. H. Burdick, director. Mr. and Mrs. Goff, who have given such efficient service at the central office for the last ten years, will also be retained. The president and Mr. and Mrs. Goff will be given an increase of salary. The Hillsdale office is giving the best of satisfaction, and the affairs of the company are about all that could be desired in a business way.

Additions and repairs to the Milwaukee plant of the Wisconsin Telephone Company to the amount of $161,000 and to lines outside of Milwaukee to the amount of $119,000 were ordered at the quarterly meeting of the directors of the company. The regular quarterly dividend of $2 a share was voted.

INCORPORATIONS

Articles of incorporation have been filed with the secretary of state by the Okeechobee Telephone Company, Okeechobee, Fla., with $15,000 capital stock. R. E. McLaughlin is president and B. M. McLaughlin, secretary-treasurer.

The Modoc & Marigold Telephone Exchange at Modoc, Ill., has been incorporated with $940 capital stock by Albert T. Hofman, A. J. Pautler and John A. Mudd.

Articles of incorporation have been filed by the Stanford Telephone Company, Stanford, Ind., with $550 capital stock. The incorporators are: Robert S. Whaley, Charles Hudson, Thomas Phillips, Henry A. Brown, Stanley Whaley and others.

Articles of incorporation have been filed by the Delton Telephone Company, Delton, Mich., with $2,400 capital stock. The incorporators are: William Mason, president; Chas. Kahler and A. W. Collison, all of Delton.

The Prairieville Telephone Company, Prairieville, Mich., has been organized with $8,000 capital stock. The incorporators are: Fred O. Hughes, of Delton; W. L. Thorpe, of Cressey, and S. R. Rogers, of Doster, Mich.

The Alden Telephone Company, Alden, Minn., has been incorporated with $25,000 capital stock by J. A. Hazle, Alden, president; B. C. Hazle, Alden, secretary-treasurer; D. W. Gretorex, Blue Earth, vice-president; A. R. Hazle and H. H. Hazle, Alden.

Articles of incorporation of the Henning-Ottertail Co-operative Telephone Company at Fergus Falls, Minn., was filed recently in the register of deeds office. The company has a capitalization of $2,000 and its officers are: Henry Barthles, president; Dick Bolland, vice-president, and George H. Miller, secretary and treasurer.

The Bozeman-Norris Telephone Company at Bozeman, Mont., has filed articles of incorporation with $40,000 capital stock. The company will operate a telephone line from Bozeman to Norris and a number of other points. The incorporators are Horace A. Cleaveland, J. T. Eastlick and C. W. Hudson, of Norris; Daniel P. Inabnit, Bozeman, and E. McDonnell, Manhattan.

The Ideal Mutual Telephone Company at Winner, So. Dak., was recently organized with the following officers: W. W. Lenker, president; L. F. Heller, vice-president; C. H. Flint, secretary; A. C. Ivers, treasurer. Nels Anderson, W. C. Balfany and Frank Frank were elected directors.

Articles of incorporation have been filed by the Ashe Telephone Company, of Jefferson, Va., with $25,000 capital stock.

The Clay Citizens' Telephone Company at Clay, W. Va., has been incorporated with $5,000 capital stock to operate a telephone system in Clay county. The incorporators are: W. S. Pierson, B. C. Eakel, P. M. Summers, R. A. Hamrick and S. W. Bryant, all of Clay.

Coon Brothers Telephone Company, Rantoul, Illinois, capital stock decreased from $60,000 to $45,000.

The Dell Rapids & Baltic Telephone Company, South Dakota, has been incorporated with $5,000 capital stock by O. O. Lyng and Andrew Anderson, of Dell Rapids, and A. P. Bakken, of Baltic, S. D.

Articles of incorporation have been filed for the Hillsview Telephone Company at Hillsview, McPherson county, South Dakota, with a capital of $2,000. Incorporators: Fred Schneider, George Hoffman, Jacob Schneider.

Toole County Telephone Company of Sweet Grass, Montana, is to build a line from Shelby to Sweet Grass. Incorporators: R. C. Lehman, S. D. McCrea and Kenneth Pike, all of Toole county. Capital, $50,000.

The Forbes Valley Telephone Company, Forbes, N. Dak., has been chartered by the secretary of state to build a telephone line 15 miles northwest from Forbes, with eight miles of branch lines, to cost $1,800. W. H. Haas, Michael Halloch and A. S. Marshall are the incorporators.

The Medford & Northeastern Telephone Company, Medford, Okla., has filed articles of incorporation with $1,000 capital stock. The incorporators are O. V. Williams, E. G. Costner and J. F. O'Connor, all of Medford.

Articles of incorporation have been filed by the Dry Creek Mutual Telephone Company of Bonesteel, S. Dak., with $5,000 capital stock. The incorporators are: Ed Tarr, Clyde Pepper and George Ott, of Fairfax, S. Dak.

The Clearfield Farmers' Telephone Company of Clearfield, S. Dak., has been incorporated with $2,500 capital stock by E. C. Kunde, W. F. Schultz and G. E. Bradford, all of Clearfield.